Thesis/
Reports
Gilman,
P.A.

The Rising Site Archaeological Project: Investigating and Preserving a Heavily Eroded Site Near Douglas, Arizona

28-JV6-929Final

The Rising Site Archaeological Project: Investigating and Preserving a Heavily Eroded Site Near Douglas, Arizona

Patricia A. Gilman
Department of Anthropology
University of Oklahoma
Norman, OK 73019

with reports by
Suzanne K. Fish
James A. McDonald
Elizabeth Miksa
Paul E. Minnis
E. Gene Riggs
Kari M. Schmidt
M. Steven Shackley
Michael Wiley

July 1999

Final report submitted to the Coronado National Forest,
USDA Forest Service, Tucson, AZ

RMRS Library
USDA Forest Service

SEP 2 1

240 W Prospect Rd
Fort Collins CO 80526

TABLE OF CONTENTS **Page**

The Purpose of the Rising Site Archaeological Project 3
Management of a Heavily Eroded Site by James A. McDonald 3
Research on a Heavily Eroded Site by Patricia A. Gilman and James A. McDonald 5

The Field Project 7
Work on the Site Before the Initial Foray 7
The Initial Foray 7
Excavation 8
Site Maps 8
Control, Surface Collection, and Excavation Squares 8
Features 11
Test for Amount of Erosion 13

Results 14
Management by E. Gene Riggs 14
Summary of the Project Experiment 14
Archaeological Unit Comparisons 15
Research 17
Radiocarbon Dates 17
Ceramics 17
Petrographic Analysis by Patricia A. Gilman, Elizabeth Miksa and Michael Wiley 18
Chipped Stone 20
Projectile Points 22
Obsidian Sourcing by M. Steven Shackley and Patricia A. Gilman 22
Ground Stone 23
Plant Remains by Paul E. Minnis 24
Pollen Analysis by Patricia A. Gilman and Suzanne K. Fish 26
Faunal Remains by Kari M. Schmidt 28

Summary and Conclusions 32

Acknowledgments 35

References Cited 37

Appendixes 40

FIGURES

Figure 1. General Project Location.
Figure 2. Map of Rising Site Showing Excavation Units.
Figure 3. QmFLt Ternary Diagram of Petrographic Results.
Figure 4. Quartz/Feldspar, Basalt, and Rhyolite Ternary Diagram of Petrographic Results.
Figure 5. Quartz, Feldspar, and Rhyolite Ternary Diagram of Petrographic Results.

TABLES

Table 1. Artifacts By Observation Unit.
Table 2. Data for All Control, Surface Collection, and Excavation Squares at the Rising Site.
Table 3. Rising Site Feature Data.
Table 4. Summary of Artifact Counts Before and After the Experiment.
Table 5. Radiocarbon Dates From the Rising Site.
Table 6. Sherd Count Summary From the Rising Site.
Table 7. Chipped Stone Raw Materials From the Rising Site.
Table 8. Chipped Stone Flake Forms From the Rising Site.
Table 9. Obsidian Sources From the Rising Site.
Table 10. Ground Stone Materials From the Rising Site.
Table 11. Ground Stone Forms From the Rising Site.
Table 12. Charred Propagules From the Rising Site.
Table 13. Wood Charcoal From the Rising Site.
Table 14. Uncharred Propagules From the Rising Site.
Table 15. Pollen Results From the Rising Site.
Table 16. Summary of Rising Site Archaeofaunal Remains by MNI, NISP, and Percent.

APPENDIXES

Appendix 1. Comparisons of Control, Surface Collection, and Excavation Units Before and After the Experiment by Gene Riggs.
Appendix 2. Sherd Counts by Provenience and FS Numbers From the Rising Site.
Appendix 3. Preliminary Results From Petrographic Analysis of Sands and Sherds From the San Bernardino Valley, Southeastern Arizona by Michael Wiley and Elizabeth Miksa.
Appendix 4. Chipped Stone Counts by Raw Material and Form From the Rising Site.
Appendix 5. Projectile Points From the Rising Site.
Appendix 6. An Energy Dispersive X-Ray Fluorescence (EDXRF) Analysis of Obsidian Artifacts From AZ FF:12:48 (ASM), Southeastern Arizona by M. Steven Shackley.
Appendix 7. Ground Stone From the Rising Site.
Appendix 8. Sorted and Scanned Ethnobotanical Samples From the Rising Site by Paul E. Minnis.
Appendix 9. Faunal Descriptions From the Rising Site by Kari M. Schmidt.

The Purpose of the Rising Site Archaeological Project

Management of a Heavily Eroded Site by James A. McDonald

The Rocky Mountain Forest and Range Experiment Station, a unit of the USDA-Forest Service, is engaged in a long-term research program entitled "Sustaining Ecological Systems of the Southwestern Borderlands." In collaboration with the Coronado National Forest, the Natural Resources Conservation Service, the Arizona and New Mexico State Land Departments, the Malpai Borderlands Group, and the Animas Foundation, the Station is developing methods to restore natural ecosystem processes and improve the productivity of savanna grasslands and woodlands in southeastern Arizona and southwestern New Mexico.

Return of a natural fire regime is believed to be the key to achieving these goals. Research is therefore focused on finding the best methods to re-establish a natural fire regime and on evaluating the actual effectiveness of fire in maintaining savanna grasslands and woodlands. A specific research project will impact the Rising site (AZ FF:12:48 [ASM]/ AZ FF:12:3 [CC]), located on Arizona State Trust and private land in Cochise County, east of Douglas (Figure 1). The land on which the site is located is experiencing an invasion of shrubs, particularly mesquite, at the expense of grass, and it is also undergoing significant surface and gully erosion.

It is necessary to re-establish grass on AZ FF:12:48 before fire can be used to control mesquite in the area. A grass cover will also reduce erosion. The archaeological mitigation project discussed here only assessed the possible impacts of placing many cattle on the site; it did not evaluate the impact that fire would have on the shallow archaeological deposits.

The technique proposed to re-establish an herbaceous cover is first to distribute native grass hay throughout the area, and to follow this with a concentration of cattle on the locality. Specifically, about 300 cattle would be concentrated on a 25 acre area for two to three days. A two-wire electric fence would be used to hold the cattle. In half of

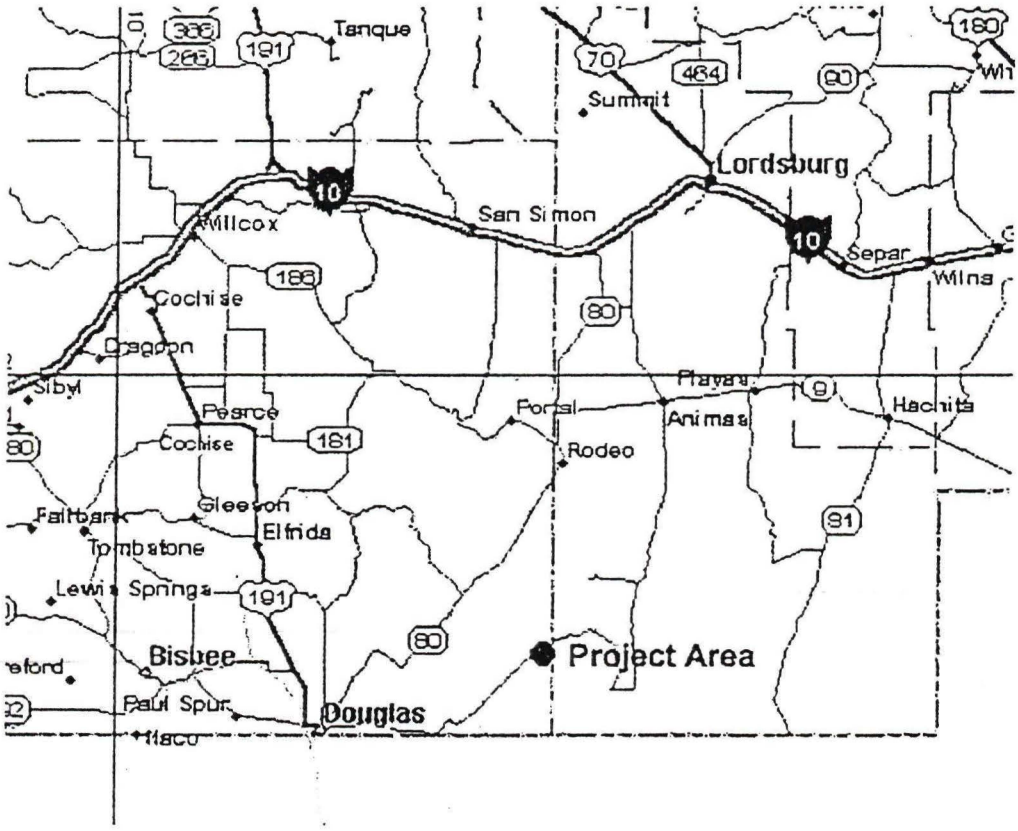


Figure 1: General Project Location

the area, mesquite would be hand-cut using chain saws or brush cutters. In the other half, no mesquite would be cut. The experiment would assess the effectiveness of using cattle to work grass seed into the soil and fertilize the seed, and the effectiveness of cutting the mesquite to temporarily reduce transpiration by shrubs, thereby increasing the moisture available to the grass. Once grass cover is established, fire will be used to keep mesquite from obtaining its previous dominance on the site. Fire will damage older trees, reduce the survival of sprouts, keep surviving sprouts from growing to potential, and eliminate mesquite seeds in the surface soil and litter. By way of contrast, conventional methods would use mechanical equipment (bulldozers and seed drills) to remove the mesquite and establish grass cover.

The project was originally proposed for mechanical treatment in 1994, at which point it was noted that the area contained a substantial archaeological site. The potential impacts of mechanical brush treatment on AZ FF:12:48 caused the project to be put on hold. The Rocky Mountain Forest and Range Experiment Station subsequently became involved in an effort to develop treatment methods that would be effective in establishing a grass cover and which would have fewer impacts on the archaeological site. Thus, it is not that an archaeological site was chosen for the location of this experiment where other shrubby and eroded locales were available. The area of the Rising site is the most heavily eroded and shrubby of any in the region, and the experiment was placed there for this reason.

Currently, the local vegetation is dominated by mesquite, with virtually no grass on the site terrace. Vegetation plots established for the range experiment averaged 70 percent bare ground, 14 percent mesquite, and nine percent organic litter (mostly mesquite leaves). Minor components of the ground cover include annual grasses, snakeweed, saltbush, plains bristlegrass, and sacaton grass (Coronado National Forest files). A grass cover of 50 to 60 percent is considered "normal" (Carl Edminster personal

communication, 1997). If the experiment is successful, it will stabilize the site deposits, something that will not happen if the site is left in its "natural" state.

The replacement of grass by trees and brush during the historic period is well documented and its causes debated (Bahre 1991; Brown 1994:130-131 for additional sources; Hastings and Turner 1965). At the Rising site, vegetative change is likely the result of intensive historic use of the locality. The area has been grazed since the early twentieth century. Also, the site of the Cottonwood Creek School lies just to the northeast. Bill McDonald (personal communication, 1995), the local landowner and grazing permittee for the State Trust land included in the project, has indicated that the school served as the social focus of the dispersed Cottonwood Creek ranch community, with gatherings that resulted in camping within the project area. While historic use is likely to have played a role, the influence of a serious drought during the 1950s (Wilkinson, Swetnam, and Baisan 1996) should not be discounted. In this semidesert grassland, slight changes in the precipitation/evaporation ratio can have significant effects on vegetation (Lowe 1964:20-23).

Studies at the Rising site clearly have the potential to produce information useful for archaeological site management. This revegetation project is designed to mitigate the devastating erosion that is occurring unchecked on the site. If the revegetation works, the erosion will stop, and we will know that this method might be appropriate on other similarly situated sites. Further, we gathered quantifiable data on artifact condition and visibility before and after grazing so that we can state the impact the actual revegetation project will have had on the archaeological site.

Research on a Heavily Eroded Site by Patricia A. Gilman and James A. McDonald

Richard Myers (1967) of Cochise College first recorded Locus A of the Rising site as the surface find of a Folsom point. Myers also noted that gray, brown, red, red-on-brown, and corrugated ceramics were present, as well as much lithic debris, especially jasper material. The Forest Service archaeologists re-recording the site in 1996

felt that it may have had a habitation function since there was burned adobe and a great number and diversity of artifacts present. They also noted at least two roasting pits and several other rock concentrations. Both erosion and a hundred years of artifact collecting have destroyed most of contexts that would have told us about the site and the people who lived there. However, corrugated and painted ceramics, including Mimbres Classic Black-on-white and Encinas Red-on-brown, still present on the surface gave a minimal date of A.D. 1000 to 1130.

Locus B, a second concentration of artifacts, approximately 100 by 120 m, lies at the southwestern corner of the project area. The initial survey of this concentration noted only a few plain ware sherds and the base of a San Pedro projectile point, suggesting that this area might be earlier than the main part of the site.

Our research at the Rising site had two foci. Given the general lack of archaeological investigations in far southeastern Arizona, we placed one research focus on culture history. Douglas (1987, 1990, 1995, 1996) has done most of the archaeological research in this part of southeastern Arizona, and his interests have concentrated on Animas phase materials that are later than those on the Rising site. Douglas and Brown (1984, 1985) also recorded sites from all time periods during an archaeological survey in the region. (Fish and Fish 1996 present a complete history of archaeological research in the Malpai Borderlands region.) In order to augment the earlier part of the archaeological chronology, we emphasized dating individual features and areas within the site with the possibility of using as many chronometric methods as might work. Radiocarbon dating was the only successful technique, but it produced dates for both loci on the site, as well as prehistoric and historic dates for the various roasting pits.

Our second focus was related to what analyses of specific kinds of artifacts might tell us about the economy and movements of people who lived at the site as well as about the natural environment surrounding the site. We used flotation, pollen, and faunal remains to suggest dietary patterns, and chipped and ground stone to augment these. We

emphasized the stylistic and petrographic analyses of ceramics and obsidian sourcing to evaluate the possible movements of people or goods into and out of the region. Specifically, since we knew that the site contained Mimbres black-on-white pottery, one production center of which is in the Mimbres Valley in southwestern New Mexico, we wondered if that pottery was imported or locally made. As well, knowing that the Antelope Well obsidian is only 60 km from the site, we speculated that it would be the only kind of obsidian on the site. Flotation, pollen, and faunal analyses also suggest the past environmental conditions, which might be considerably different from those of today. Given that two parts of the site probably dated to different time periods, the potential existed for examining changes through time in the activities of people at the site.

The Field Project

Work on the Site Before the Initial Foray

Our initial project foray onto the Rising site was preceded by a 1994 pedestrian survey of the parcel done by Wally Alexander, para-archaeologist for the Arizona State Land Department, followed with a site inspection by Ken Rozen, State Land Department archaeologist. Alexander and Rozen filed their recorded site information at the Arizona State Museum, and the Museum numbered the site as AZ FF:12:48 (ASM). McDonald and Kay Rosenow, an Arizona Site Steward, re-surveyed the project area in August of 1995, walking parallel northeast-southwest transects 10 to 15 m apart. During the next year, McDonald re-inspected the site two more times. In September of 1996, he participated in preliminary topographic mapping of the site. During the mapping, Bill Gillespie and Kathy Makanski, archaeologists from the Coronado National Forest, did a reconnaissance-level inspection of the surrounding area.

The Initial Foray

On October 14 through 16, 1996, McDonald and Gilman, assisted by other Coronado Forest archaeologists and by avocational volunteers, conducted intensive mapping, surface artifact recording (but no collection), and additional reconnaissance of

the surrounding area. The surface observations consisted of detailed examinations and counts of artifacts in 1x1 and 2x2 m units spaced every 20 m along north-south and east-west baselines laid out across Loci A and B of the site (Table 1). In this way, we accurately mapped the area of the site according to artifact densities as 15,400 m^2 (140 by 110 m) for Locus A and 12,000 m^2 (100 by 120 m) for Locus B, although the latter had a much lighter artifact scatter. The map and its associated artifact densities greatly assisted us in deciding the placement of control, surface collection, and excavation squares during the excavation phase of the project.

Excavation

Site Maps. From our work at the site, we produced two maps. The first (Figure 2) shows the excavation units, including the features, while the second will be a computer-generated map; the Forest Service has not completed the latter.

Control, Surface Collection, and Excavation Squares. In order to assess the impact of the revegetation procedure on the site, we devised a system using three kinds of squares, control, surface collection, and excavation, in various parts of the site (Table 2). Within Locus A, we placed a set of three 2x2 m squares in an area of low artifact density (N1934, E418), as well as a set in each of two higher density areas (N1995, E476; N2016.5, E459) in order to evaluate the revegetation impact. We also placed a set of three squares in Locus B (N1668, E368). We recorded the artifacts but did not collect them in each control square, we surfaced collected the second square, and we excavated the third square to sterile soil. All squares were located on the maps, recorded, photographed, and marked in the field so that Gene Riggs could return to the site after the cattle had been removed and evaluate possible impacts.

We collected all of the visible artifacts, regardless of their sizes, from the surface collection squares. In this way, Mr. Riggs could assess whether the cattle had kicked up subsurface artifacts.

Table 1: Artifacts by Observation Unit

Unit	Sherds	Lithics	Groundstone	Cores	Fire-Cracked Rock	Total	Density (sq/m)
E0/N179-180							
E0/N159-160							
E0/N139-140							
E0/N119-120							
E0/N99-100							
E0/N79-80							
E0/N59-60	12	2				14	14
E0/N39-40	12	3				15	15
E0/N19-20	10	5	1		1	17	17
E19-20/S1	32	19	3			54	54
E29-30/S1	6	4				10	10
W3-4/S1	66	40	2			108	108
W8-10/S1-2	163	93	5	3	3	267	67
W19-20/S1	30	13		1	3	47	47
W39-40/N0	3					3	3
W59-60/N0	1					1	1
W79-80/N0							
W99-100/N0							
W60/S19-20	1	1				2	2
W560/S39-40	2					2	2
W60/S59-60	8	2				10	10
W60/S79-80	2	1				3	3
W60/S99-100							
W60/S119-120							
W60/S139-140		4				4	4
W60/S159-160		5				5	5
W60/S179-180				1		1	1
W60/S199-200							
W60/S219-220							
W60/S239-240							
W60/S259-260							
W60/S279-280		1				1	1
W60/S299-300	2	4				6	6
W60/S319-320		1				1	1
W60/S339-340		3				3	3
W79-80/S340	2	2				4	4
W99-100/S340		1		1		2	2
W119-120/S340							
W126-128/S345-347	29	7	8	4		48	12
W139-140/S340							
W159-160/S340	1	3			1	5	5
W179-180/S340	1					1	1
W180/S359-360							
W180/S379-380	2					2	2

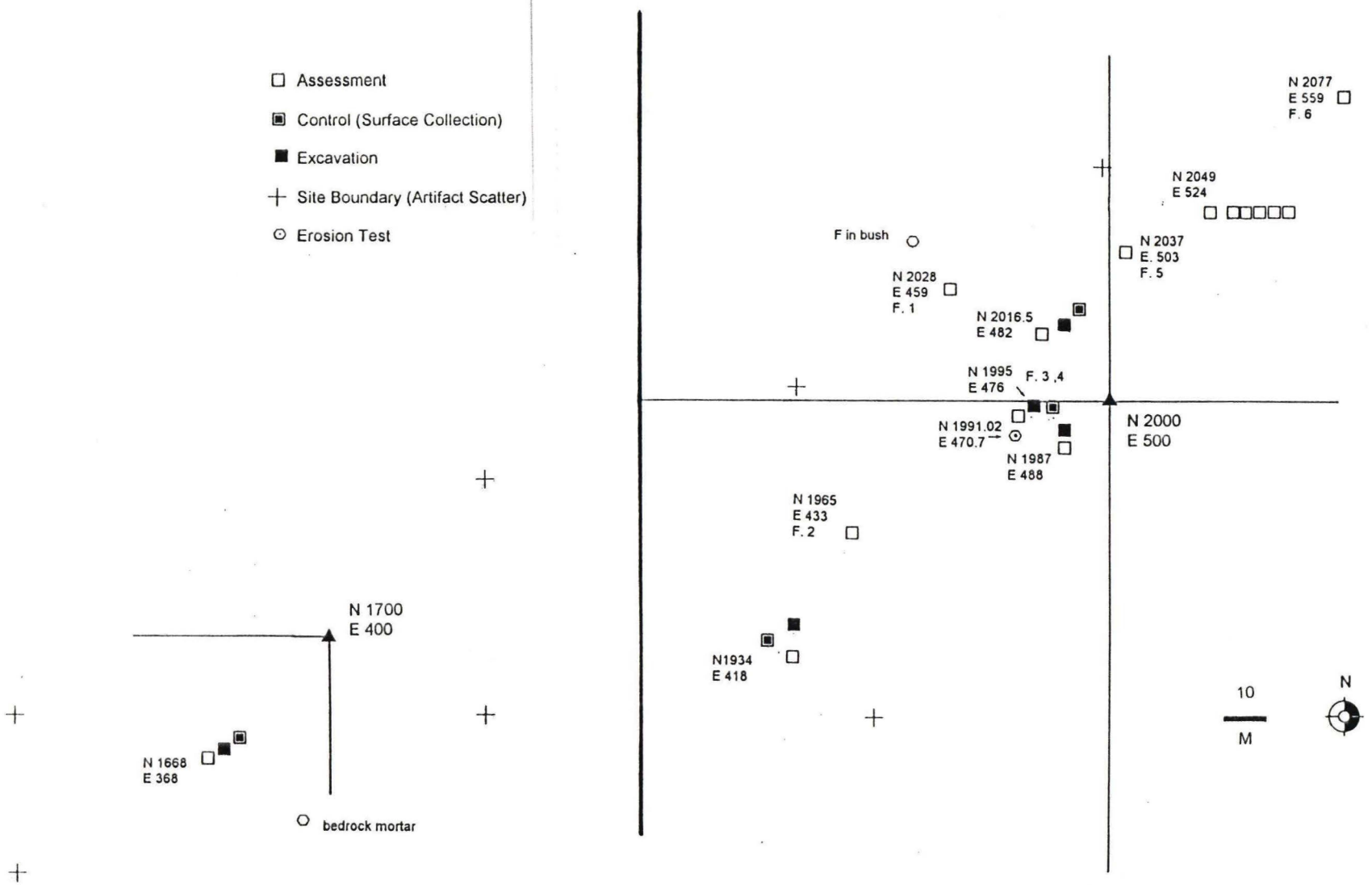


Figure 2. Map of Rising Site Showing Excavation Units.

Table 2. Data for All Control, Surface Collection, and Excavation Squares at the Rising Site.

Provenience	Square Type	Excavation Depth	Artifacts Present?	C14 Date**
N1668 E368	Control	-	1 cs	-
N1672 E370	Excavation	2-20 cm BGS*	1 me, gs, cs, cer, bone, char	A.D. 225-410
N1674 E372	Surface Coll.	0-8 cm BGS	cer, cs, gs, char, obs	-
N1934 E418	Control	-	1 cer, 3 cs	-
N1938 E412	Surface Coll.	surface	cer, cs	-
N1942 E418	Excavation	0-19 cm BGS	cs, wire	-
N1987 E488	Control	-	355 cer, 255 cs, 2 gs, 1 bone	-
N1991 E488	Excavation	4-6 cm BGS	cer, cs, gs, bone, char, obs	-
N1995 E476	Control	-	?	-
N1997 E480	Excavation	0-16 cm BGS	cer, cs, gs, obs, char	-
N1997 E484	Surface Coll.	surface	cer, cs, gs, obs, bone	-
N2016.5 E482	Control	-	17 cer, 8 cs	-
N2018 E488	Excavation	20-30 cm BGS	cer, cs, char	-
N2023 E491	Surface Coll.	surface	cer, cs	-
N2049.25 E524, 530-538	Excavation	1-20 cm BGS	cer, cs, gs, bone, adobe, char	-

* The varying excavation depths are due to attempts to even out the ground surface irregularities. Sterile soil was quite close to the ground surface in many instances.

** See Table 5 for complete data.

Key: cs=chipped stone; BGS=below ground surface
me=metate; gs=ground stone
cer=ceramic; char=charcoal
obs=obsidian

The purpose of the excavation units was to evaluate the depth and nature of subsurface deposits, to collect artifacts, charcoal for dating, flotation samples, and pollen samples that would allow us to learn something about the people who lived at the site, and to mitigate any damages that the revegetation project might cause. We generally excavated in arbitrary 10 cm levels, and we screened all soil through quarter inch screen. We attempted to use finer screen, but the soil was too clayey and too wet from the heavy rains to make this an efficient procedure in the week that we had. We did screen some of the soil from the excavation units around the burned adobe chunks (N2049.25, E524, 530-538) through eighth inch screen. Since the screen provides the analytic sample by size of artifact, we collected every artifact present in the screens.

The squares discussed above were all placed along small arroyos that are cutting back from the main drainage, since hay for the cattle would be placed in these cuts. In order to increase our artifact sample, we augmented this excavation strategy with two squares (N1987, E488), one that was a control square and one that was excavated, in the middle of the densest artifact concentration on the site. We also investigated an area on the site where there were many burned chunks of adobe (N2049.25, E524, E530-538), using a long, segmented trench through the area to detect any house remains.

In Locus A, the squares in the low artifact density area (N1934, E418) produced few artifacts, all artifacts were ceramics and chipped stone (Table 2), and there were no subsurface prehistoric artifacts. Wire in the excavation unit suggested historic disturbance. This area is on the southwest edge of the site, and its placement may account for the low artifact densities and the lack of any charcoal or other artifacts.

In an area of medium artifact density nearer the center of the site (N2016.5, E482), there were more artifacts, although still only chipped stone and ceramics. There were few artifacts below the ground surface. Charcoal was present, although not enough to date. This set of squares was located on the edge of a small drainage cutting across the site.

The area of highest surface artifact density was also the place with the highest artifact variety (N1987, E488). As noted above, we excavated an additional set of squares in this area to augment our artifact sample size. Although the surface of the area had a high artifact density (see Appendixes 2 and 4), including ground stone and rocks, there were fewer than 10 subsurface sherds and lithics. Sterile soil was 4 to 6 cm below the present ground surface. The heavy erosion on the site doubtless accounts for the high artifact concentration here, but the original context of the artifacts, whether midden or structures, is unknown.

Just northwest of this dense artifact concentration near a shallow erosion channel was a set of three squares (N1995, E476) with a relatively heavy artifact scatter that included fire-cracked rocks. The excavation square had indications of a shallow, basin-like floor 13-17 cm below the present ground surface, defined by a circular area at least 1.15 m across (Feature 3; Table 3). The area contained pieces of rooffall (originally called Feature 4) that were 3 to 5 cm thick, burned adobe, and artifacts, but it is not clear whether the feature represented a structure or an outdoor activity locus. A radiocarbon date from the rooffall separated from the floor by a very thin, fine sand layer was A.D. 1020-1220 (Table 5), nicely bracketing the likely dates for the painted ceramics in Locus A. Because of the heavy erosion, little remained of the structure/activity area.

In the area of the site where there were burned adobe chunks with reed impressions on the ground surface (N2049.5, E524, E530-538), we placed a series of trenches (.75 by 2 m) through and beyond the two adobe concentrations. There was a variety and moderate density of artifacts present, but few below the ground surface. There was not enough charcoal to date the unit. Although there were dark and light stained areas, we could see no evidence of a structure beyond the burned adobe chunks, even though we excavated well into sterile soil in some places in search of a floor. It is possible that there was a clay surface less than 10 centimeters below the present ground surface, but we could not make a convincing case for it. There was a complete circular

Table 3. Rising Site Feature Data.

Feature Number	Provenience	Plan Shape	Plan Size (cm)	Profile Shape	Depth (cm)	Fill	C14 Date* 2 sigma; all A.D.	Possible Function
1	N2028 E459	Circular	120 x 150	Basin	16	FCR above charcoal	1430-1670	Roasting pit
2	N1965 E433	?	?	?	Surface	None	None	Eroded roasting pit/hearth?
3	N1997.05 E481.10	Circular?	115 x 28+	Basin	12-13	Charcoal	1020-1220	House floor?
4	N1997.05 E480.37	-	-	-	-	-	None	Rooffall; not a feature
5	N2037 E503	Circular	40 x 40	Basin	6	FCR, charcoal	1005-1180	Roasting pit/hearth
6	N2077 E559	Circular	140 x 140	?	14	FCR, charcoal	1525-1950*	Roasting/branding pit

* See Table 5 for complete data.

Key: FCR=fire cracked rock

granite mano (FS 183) set 6 cm below the present ground surface embedded in a clay layer, perhaps representing sterile soil.

We placed the squares in Locus B over a relatively dense artifact scatter of chipped stone and plain ware ceramics on the west side of a small wash. The excavation square revealed a cluster of ground stone. Two granite metate fragments (FS 160, 161; Appendix 7) were placed upside down resting about 7 cm below the present ground surface; one of these was a basin metate, while the other was a slab metate. A basalt mano fragment (FS 159) and a possible ground stone fragment made of tuff (FS 156) were also present in this level. A third metate (FS 267), which was basin-shaped, large, complete, and ground on both sides, was placed 33 cm below ground surface. There were also three metate fragments (FS 256, 257, 258) in this lower level; two of these were basalt, and one was granite, and they were all either slab or basin metates.

In order to clarify the nature of the ground stone cluster and because there was a dark stain in the center of the diagonally adjacent surface collection square, we excavated a bit into that square. There was one mano (FS 92), a mano fragment (FS 94), and one piece of indeterminate ground stone (FS 155) along with rocks on the surface of the unit, and an ashy hard-packed area under the surface. Lack of time prevented us from determining the nature of Locus B, but a radiocarbon date of A.D. 225-410 from charcoal in the excavation square parallels the presence of only plain ware pottery, slab and basin metates to the exclusion of other forms, and perhaps also the San Pedro point base. The ground stone concentration remains intriguing since it is so close to the present-day small drainage and the larger Cottonwood Wash. There is also a bedrock mortar about 20 m southeast of the excavations in Locus B (N1653, E393), and so perhaps the ground stone represents food processing activities that occurred near these washes.

Features. There were several rock features evident on the site surface, and we excavated a sample of half (Features 5 and 6) or less (a third of Feature 1) from each in order to determine the size, shape, and fill of the features and to obtain dating, flotation,

and pollen samples (Table 3). Portions of each feature were left to assess the project impact and for future investigations. Aside from the three pit features excavated, there was a scatter of fire-cracked rocks (Feature 2; Table 3) near the west edge of Locus A (Figure 2) that had no remaining subsurface deposits and that probably represented an eroded roasting pit or hearth. There was also a rock cluster embedded in a mesquite bush (N2040, E450; Figure 2) that may have been a similar feature.

Feature 5 was the smallest of the pit features, and it dated by radiocarbon to A.D. 1005 to 1180 (Table 3), spanning the time period of Locus A suggested by the pottery. It was thus the only one of the three dated pits that associated with Locus A, and it was within the artifact scatter as defined by the high artifact densities to the south and the artifacts within the adobe chunk concentration to the northeast (Figure 2). Corrugated sherds, plain sherds, and angular debris were present on the feature surface, and there were five plain sherds in the fill along with fire-cracked rocks and a small amount of charcoal. The pieces of burned wood in the feature were too small to identify, and there were no burned seeds or animal bone to indicate the pit function. The excavators felt that much of the feature had eroded away, especially given the lack of definition of the western feature edge, which was downslope and closest to a small drainage.

Feature 1, a larger and deeper pit than Feature 5 (Table 3), produced a later radiocarbon date of A.D. 1430 to 1670, clearly within the protohistoric time period (and so perhaps Apache or Sobaipuri) and later than the artifacts associated with Loci A or B on the site. The feature was on the northwest side of Locus A (Figure 2), but it was within the artifact scatter. The only artifacts associated in any way with the feature were in the first three centimeters and included one corrugated and two plain sherds (FS 4) and one secondary flake (FS 3); these artifacts may really associate with the Locus A materials instead. Large fire-cracked rocks were present in the first five centimeters of the feature fill, and there was charcoal throughout. Because of the extensive smear of fire-cracked rocks and charcoal beyond the upper pit edge, the excavators assumed that the upper

portion of the pit had eroded away. Charcoal in the pit was mostly *Platanus* (sycamore) and *Prosopis* (mesquite) or other legume with a small amount of *Atriplex* (saltbush) (see section by Minnis in this report). There were no burned seeds or animal bones that might suggest the pit function.

Feature 6 was different again from the other two dated pits on the site (Table 3). It was northeast of the artifact scatter that defined the site (Figure 2), it was even larger than Feature 1, and the radiocarbon date (A.D. 1525 to 1950) spanned the protohistoric, historic, and modern periods. The feature could be a roasting/cooking/ heating pit from any of these times, or it could be an historic branding pit. The feature was also unusual in that the greatest concentrations of charcoal and fire-cracked rock occurred toward the outer edges of the pit, where the pit was also deeper than it was in the center. There were two tertiary flakes in the pit fill. Unlike Feature 1, this pit contained no *Platanus* charcoal (see section by Minnis in this report), although sycamore trees are common along Cottonwood and Sycamore washes today at their confluence to the southwest of the site. Most of the charcoal was *Prosopis* (mesquite) or other legume with half as much *Atriplex* (saltbush). There was also one piece of charred *Quercus* (oak). Although the charcoal from two features hardly makes a pattern, the charcoal from the possibly historic feature does suggest different wood use than that from the definitely protohistoric pit in that there was no sycamore in the former, which did, however, contain the only piece of oak charcoal recovered. Again, there were no identifiable burned seeds or animal bone in this pit that would suggest its function.

Test for Amount of Erosion. The presence of many mesquite trees growing in hummocks elevated above the present ground surface on the site allowed us to examine at least some of the deposits that had eroded from the rest of the site. We placed a small test trench into the east base of a mesquite mound (N1991.02, E476.70; Figure 2), revealing two strata. Stratum 1, the uppermost, was unconsolidated fine, probably aeolian, sand with abundant organic material, mostly mesquite leaflets and twigs, and showing

discontinuous laminations. Stratum 2 was a dense, dark brown, blocky clay that characterized much of the subsurface stratigraphy on Locus A. Within this stratum, there were moderately abundant rootlets and small carbonate "dots" but no charcoal, rocks, or artifacts (although this was a very small exposure). The top of Stratum 2 was probably the ground surface when the mesquite were established here, perhaps about 20 to 50 years ago, based on plant size and appearance. This suggests a loss in recent decades of nearly 20 cm of sediment from the areas between the mesquites. Stratum 1 shows a recent aggregation of about 9 cm of sand around the mesquites.

Results

Management by E. Gene Riggs

Summary of the Project Experiment. My understanding of the experimental part of the project that followed our archaeological testing in the summer of 1997 is based on conversations with Bill McDonald, the rancher who owns part of the land in question, and Gerry Gottfried, a research forester with the Tonto National Forest in Phoenix. After the archaeologists finished in August, about 20 acres of the site area were fenced with an electrified fence. On December 10, 1997, Bill McDonald and his ranch foreman put 280 head of cattle into the fenced area. They attempted to scatter native grass hay over the area while working in heavy rain and at times in ankle-deep mud. McDonald indicated that they would have needed more people and more hay to adequately distribute hay over the area. It continued to rain the next day. The cattle were removed the morning of December 13, 1997.

On December 14, 1997, Sandi Fotinos-Riggs and I inspected the site. There were many hoof prints in the damp and drying mud, and artifacts were noted in the drying hoof prints. Whether they had been on the surface, were churned up from below, or a combination of both was not apparent. In places the hay was trampled into the mud, as it was supposed to be, while in other places, cattle traffic appeared to have been light or non-existent.

On February 11, 1998, I again visited the site and talked with Jerry Gottfried. The latter said that they had seeded the fenced area with five native plants, including blue and sideoats grama, giant and alkali sacaton, and four-wing saltbush.

Inside the fenced area, four 100 m^2 areas had been marked off and labeled M-1 through M-4. The vegetation was recorded for each plot. M-1 and M-3 were being subjected to a "lop and shelter" process in which all of the mesquite within each plot was cut near ground level, and the branches scattered over the area. Plots M-2 and M-4 were the most sensitive in terms of archaeological materials, and so the mesquite was not cut on them. A fifth plot was to be laid out across Sycamore Canyon road to the east as a control plot, to which nothing would be done. A comparison of the five plots will be made at a later date.

I returned to the site again in March and April. In general, it was apparent that noticeable disturbance from the cattle hoof prints will remain for some time unless heavy rains occur. This outcome is quite different than if the area had been dry while the cattle were present. In the spring of 1998, the primary vegetation on the units was the low, creeping plant called filaree. There were numerous weeds on many parts of the site, and the mesquite was beginning to green up.

Archaeological Unit Comparisons. To compare what we observed in July of 1997 with what was evident in March of 1998, I made forms that give a side-by-side comparison of the information for each of the various units (Appendix 1; summarized in Table 4). For the Control (Assessment) Unit forms, I used the artifact counts reported by the various crews in July 1997 plus the counts I made in March 1998. The forms for the Surface Collection (Control) and Excavation Units have my March 1998 counts. There are comments about each unit at the bottom of the forms.

During the work in July 1997, the ground was generally dry, and the surface was relatively smooth in many areas. Artifacts were loose and easily observed. In March 1998, the surface was dry but very rough over extensive areas because of the large number

Table 4. Summary of Artifact Counts Before and After the Experiment.

Provenience	Square Type	Artifacts 7-97;3-98					
		Ceramics	Chipped Stone	Obsidian	Ground Stone	Animal Bone	Fire-Cracked Rock
N1668 E368	Control	0;0	1;0	0;0	0;0	0;0	0;0
N1672 E370	Excavation	3;0	3;1	0;0	0;0	0;0	0;1
N1674 E372	Surface Coll.	13;2	12;4	0;0	5;0	0;0	0;0
N1934 E418	Control	1;1	3;2	0;0	0;0	0;0	0;2
N1938 E412	Surface Coll.	1;0	2;0	0;0	0;0	0;0	0;0
N1942 E418	Excavation	0;1	1;2	0;0	0;0	0;0	0;0
N1987 E488	Control	355;161	225;118	0;0	2;3	1;0	0;4
N1991 E488	Excavation*	1327;19	[?];7	2;0	11;0	30;0	0;0
N1995 E476	Control	33;45	16;11	0;0	2;1	0;0	6;1
N1997 E480	Excavation	63;5	27;1	1;0	1;1	0;0	11;0
N1997 E484	Surface Coll.	156;8	107;3	4;0	5;1	1;0	0;0
N2016.5 E482	Control	17;6	8;5	0;0	0;0	0;0	0;0
N2018 E488	Excavation*	25;5	6;3	0;0	0;1	0;0	0;0
N2023 E491	Surface Coll.	6;1	5;2	0;0	0;0	0;0	0;0

* From excavation of Level 1; surface artifacts not recorded.

of cattle hoof prints. Artifacts were mixed into the hardened mud and not easily seen. Even in areas not heavily trampled by cattle, artifacts were often embedded in mud and not easily identified. In units where counts were taken, I frequently loosened artifacts from the surface soil to determine whether they were artifacts or not. There were some areas that have a sandy, rocky surface that did not appear noticeably different than in July 1997.

During the October 1996 and July 1997 work, occasional sherd breakage was noted, which probably was caused by cattle being in the area previously. After removal of the cattle in December 1997, the muddy, disturbed condition of the surface made it impossible, by casual observation, to readily identify new sherd breakage.

Since the heavy December rains, there have been a few winter rains, but they seem to have been light and gentle. The hoof prints of the cattle seen in December 1997 after the cattle were removed were sharp and distinct. Three months later in March 1998, the sharp edges had been rounded by the subsequent rains, but no great changes were seen. This observation led to the conclusions, noted on most of the unit forms, that no noticeable deposition or erosion had occurred by the latter part of March. The erosion noted on a few forms probably occurred during the heavy rains at the time the cattle were placed on the site in December.

In March of 1998, much of the ground was covered by filaree, a low and extensive ground cover, making counting the artifacts present difficult. This may account for the generally lower artifact counts in March than during the previous summer from the control units where we had done no surface collection or excavation (Table 4; Appendix 1). Alternatively, the cattle, erosion, or deposition could have disturbed the ground in such a way as to diminish the numbers of artifacts. It is not surprising that artifacts were present on the surfaces of squares that we had surface collected or excavated. Such artifacts could have washed on to the squares during the rains, cattle might have kicked artifacts around or moved them from subsurface to surface deposits by sinking into the mud, and/or we might have missed artifacts during screening or surface collection. Clearly, we

know far too little about how and why the position of artifacts changes on sites, but certainly the vertical movement caused by cattle sinking into the mud at such a shallow site is as much cause for concern as the horizontal surface movement of artifacts.

Research

Radiocarbon Dates. The radiocarbon dates from the Rising site (Table 5) are discussed in the previous sections on Locus A, Locus B, and feature excavations.

Ceramics. The ceramic types present on the Rising site parallel the chronometric dating of the two site loci (Table 6; Appendix 2). In Locus B, the earlier of the two, both the fact that the sherds were plain and that there were few of them suggest this early time when people were just starting to use pottery for vessels. Locus A, on the other hand, had painted, textured (corrugated, incised, and punctate), and plain ceramics, and both the painted and corrugated types fit well with the radiocarbon dates from about A.D. 1000 to 1200. Most of the identifiable painted sherds were Mimbres Classic Black-on-white, Cibola white ware, and Encinas Red-on-brown, and the corrugated sherds were similar in style to those usually associated with Classic Black-on-white pottery. One painted ceramic type, Galiuro/Pinaleno Red-on-brown (nine sherds), is earlier than this time period, and San Carlos Red-on-brown (one sherd) is later, suggesting minor site use beyond the period. No place within Locus A seemed to be earlier or later by ceramics than any other place (Table 6); the presence of these rare earlier and later types is apparently driven by sample size.

Of the 2083 sherds collected from the site, 81 percent (1683) were plain, 14 percent (304) were corrugated, and 5 percent (97) were painted or slipped. The percentage of painted wares is not as high as it is in the northern San Simon drainage to the north where it is 22 to 26 percent in the equivalent time period (Surface Structure period; A.D. 1050 to 1150; Gilman 1997:29). On the other hand, contemporary corrugated types in the San Simon were much less common at five to seven percent. Within the painted and slipped wares at the Rising site, 50 percent (48) were San Simon

Table 5. Radiocarbon Dates From the Rising Site.

Beta Number	FS Number	Provenience	Level	Feature	Conventional Date	Calibrated 2 Sigma Date All dates are A.D.
109589	24	N2028 E459	2	1	350 +/- 70 BP	1430-1670
109590	116	N2037 E503	2	5	960 +/- 40 BP	1005-1180
109591	138	N1997 E480	2	3	920 +/- 40 BP	1020-1220
109592	185	N2077 E559	2	6	230 +/- 50 BP	1525-1560, 1630-1695, 1725-1815, 1920-1950
109593	255, 261, 326	N1672 E370	3	Locus B	1740 +/- 40 BP	225-410

Table 6. Sherd Count Summary From the Rising Site.

Site Area	Mimbres B/w	Cibola ww	Ind. ww	Encinas R/br	Gal/Pin R/br	S. Carlos R/br	Ind. R/br	Ind. R/w	Buff ware	Red ware	Corr.
Locus A											
N1938 E418											
Fea. 2				1							
N1991 E488	7	2		4	8		21	1	1	7	131
N1997 E480+	4					1	4			5	64
N2000 E510					1						
N2018 E488+	1	1		1			1				1
Fea. 1											1
Fea. 5											8
N2049 E532+	11	5	2	2			4	1			99
Total	23	8	2	8	9	1	30	2	1	12	304
Locus B	0	0	0	0	0	0	0	0	0	0	0

Key: B/w=black-on-white
ww=white ware
Ind.=indeterminate
R/br=red-on-brown
Gal/Pin=Galiuro/Pinaleno
S. Carlos=San Carlos
R/w=red-on-white
Corr.=corrugated

Site Area	Plain	Incised	Punctate	Total
Locus A				
N1938 E418	1			1
Fea. 2	17			18
N1991 E488	1137	5	5	1329
N1997 E480+	257	1		336
N2000 E510				1
N2018 E488+	42			47
Fea. 1	2			3
Fea. 5	20			28
N2049 E532+	193	3		320
Total	1669	9	5	2083
Locus B	36	0	0	36

red-on-browns, 25 percent (24) were Mimbres black-on-whites, and 12 percent (12) were red wares. The rest were rarer types. Again in the northern San Simon drainage during this time, most of the painted ceramics were Mimbres white ware types with lower percentages of San Simon red-on-browns, Hohokam red-on-buffs, and red ware types. Thus, although the northern San Simon drainage is relatively close to the Rising site and is within the Chihuahuan desert region, there are clearly different social factors functioning as evidenced by the varying proportions of ceramic types present in the same time period.

Petrographic Analysis by Patricia A. Gilman, Elizabeth Miksa, and Michael Wiley. Because some of the ceramics, especially the Mimbres and Cibola types and the micaceous plain ware pottery, might have been imported into the region, we did petrographic analysis on 15 sherds and four samples of sand from drainages near the site. (See the report by Wiley and Miksa in Appendix 3). Included in the 15 sherds were most types represented on the site - plain ware, various kinds of San Simon red-on-browns and Mimbres Black-on-whites, corrugated, and Cibola white ware - in order to produce a broad-based comparison in this initial study. The sand samples were from drainages near the site; one sample (SBV-002) was taken downstream of the confluence of drainages from which we took two other samples (SBV-001 and 003) and so probably represents a combination of the two.

As Wiley and Miksa note, the geology of the area around the Rising site is mostly rhyolite, basalt, and andesite with shale, sandstone, and limestone present (Arizona Bureau of Mines 1959). Three of the four sand samples (SBV-001 to 003) were rich in rhyolite and basalt, while the fourth (SBV-004), from a wash north of the site which drains a different area than the other three, had mostly basalt with no rhyolite.

Most of the sherds, however, were rich in rhyolite but had no basalt in their temper. These clearly could not have come from the sands in the washes nearest the site. Further, four sherds (FS 137.2, 165.3, 165.5, 198) were tempered with granitic sand; the closest granite outcrops on this side of the international border are 25 or more miles

(about 40 km) away to the north, northeast, and northwest (Arizona Bureau of Mines 1959). Three of the four sherds were red-on-browns (in order by FS number, indeterminate, Galiuro/Pinaleno, and Encinas) and the fourth sherd was a plain ware with red spots. The first three sherds were all of the red-on-browns submitted for petrographic analysis except for one indeterminate (FS 81). Miksa (personal communication, 1998) notes that the Hohokam did not use basalt for temper and speculates that this may be true in far southeastern Arizona as well. People could have made pottery in areas of non-basalt-rich sand, or they could have transported non-basalt-rich sand for temper.

Another interesting result of the petrographic analysis is that the three plain ware sherds (FS 89, 250, 260) from Locus B, the early part of the site, were compositionally different than the other sherds, both plain and painted, from Locus A. When Miksa plotted the petrographic compositions of the sherds, the early sherds always stayed together on the diagrams (Figures 3, 4, and 5; data in Appendix 3) and were separate from the other sherds and the sands.

Miksa attempted several ternary plots (Figures 3, 4, 5) in order to try to separate the painted from the plain sherds. Except for separating the early plain wares and the cluster of red-on-browns and one plain sherd from the sand samples and all other sherds, none of these plots worked well, suggesting that the people making this pottery did not necessarily use different temper for plain versus painted pottery. The first plot (Figure 3) is a standard QmFLt ternary diagram that shows the primary relationships. In this view, the sands look like the tempers because the rhyolite and the basalt are not separated. The second diagram (Figure 4) puts quartz plus feldspars at the top and basalt and rhyolite on the other two corners. In this view, the sands and the sherds are distinguished, but the sherd groups are all on the LVM(basalt)=0 line, and so they cannot be differentiated. The third diagram (Figure 5) is a plot of rhyolite, quartz, and feldspar, but again the sands look like the tempers because basalt is not taken into consideration.

Figure 3. QmFLt Ternary Diagram of Petrographic Results.

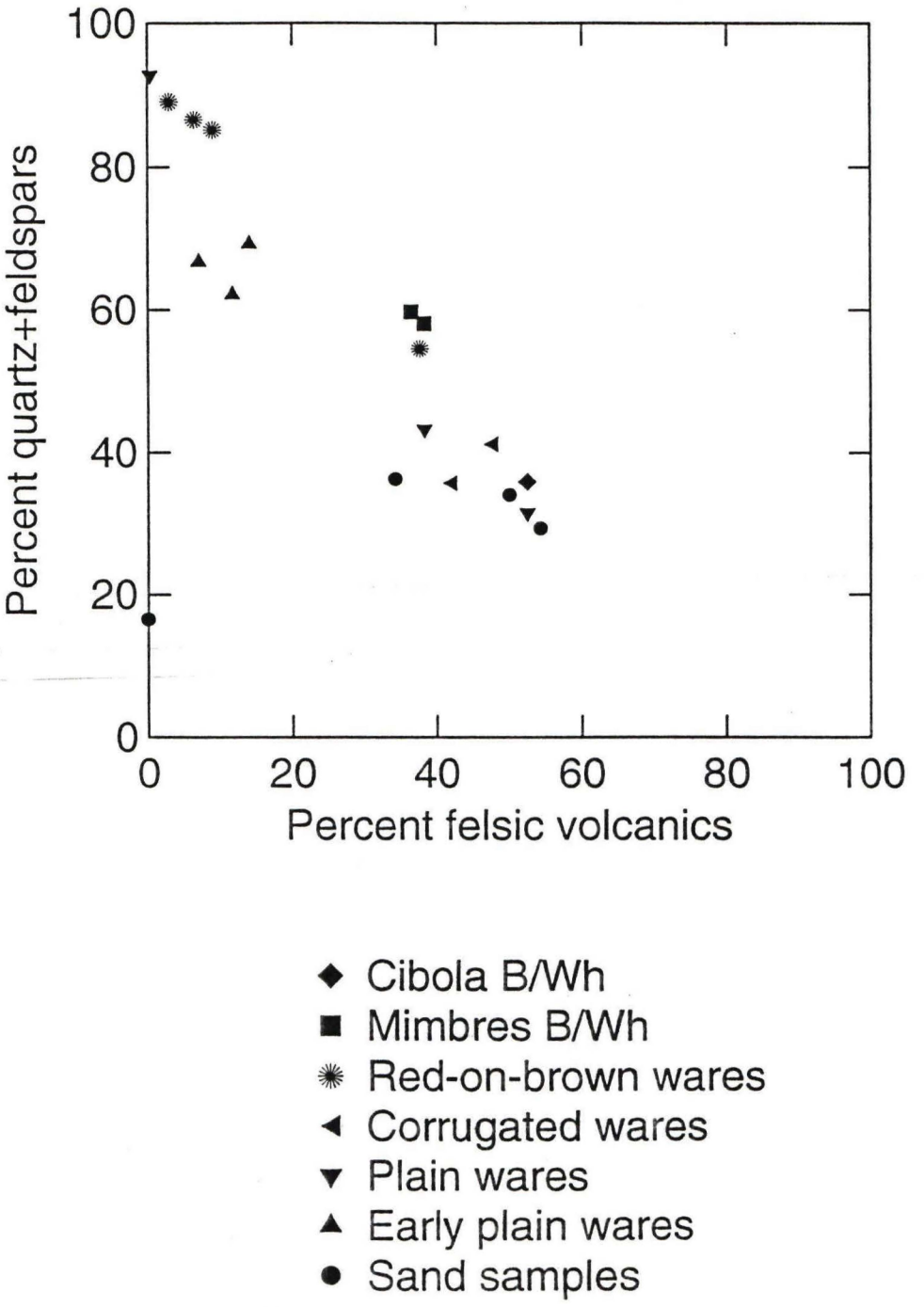


Figure 4. Quartz/Feldspar, Basalt, and Rhyolite Ternary Diagram of Petrographic Results.

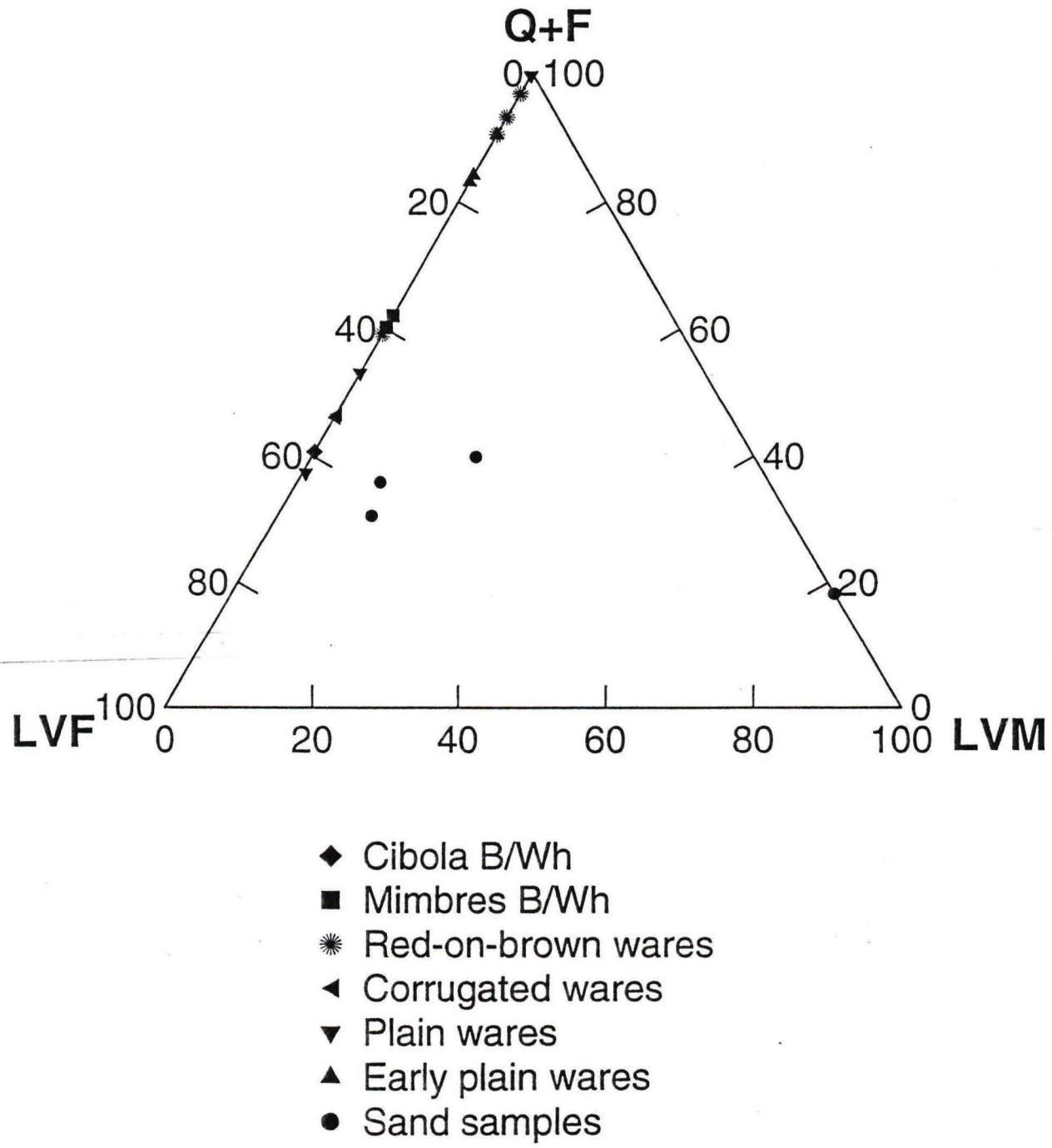
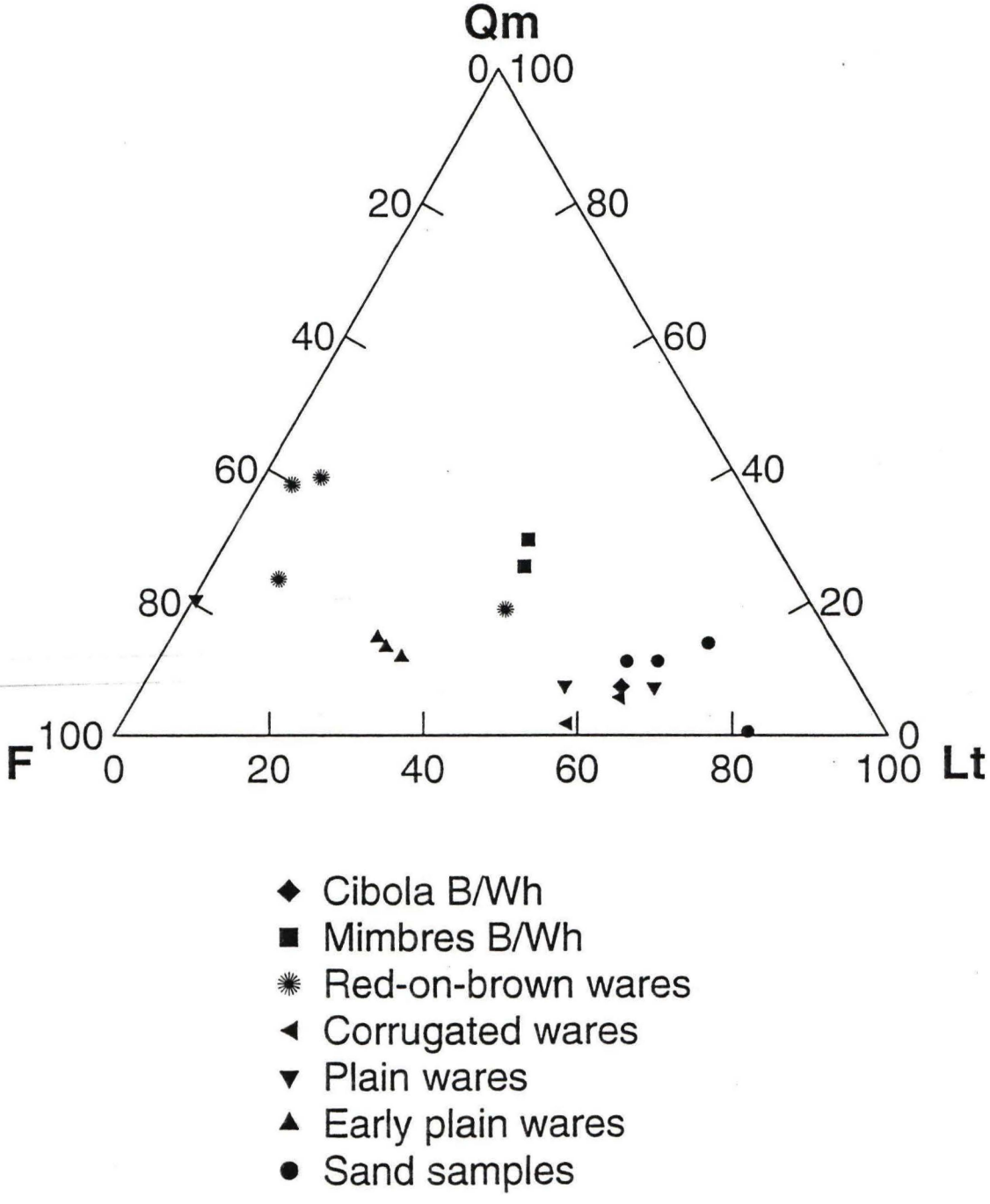


Figure 5. Quartz, Feldspar, and Rhyolite Ternary Diagram of Petrographic Results.



Data for the QmFLt ternary diagram
(Q=quartz, F=kspar+micr+plag+plagal+plaggn, L=all lithic frags. Data are normalized for the ternary system.)

* Case ID *	Q	F	L
FS-006	0.072	0.264	0.664
FS-081	0.189	0.399	0.413
FS-089	0.117	0.569	0.314
FS-137.1	0.074	0.379	0.546
FS-137.2	0.234	0.670	0.096
FS-165.1	0.017	0.407	0.576
FS-165.2	0.057	0.319	0.624
FS-165.3	0.376	0.581	0.043
FS-165.4	0.294	0.316	0.390
FS-165.5	0.388	0.537	0.075
FS-198	0.204	0.792	0.004
FS-211	0.253	0.342	0.405
FS-214.1	0.073	0.307	0.620
FS-250	0.132	0.582	0.286
FS-260	0.146	0.585	0.268
SBV-001	0.111	0.240	0.649
SBV-002	0.138	0.161	0.701
SBV-003	0.111	0.280	0.609
SBV-004	0.006	0.177	0.818

Data for the Q+F, LVF, LVM ternary diagram
(LVF2=LVF+LVFb, LVM2=LVM+LVI. Data are normalized for the ternary system.)

* Case ID *	Q+F	LVF2	LVM2
FS-006	0.373	0.622	0.004
FS-081	0.592	0.408	0.0
FS-089	0.841	0.159	0.0
FS-137.1	0.530	0.470	0.0
FS-137.2	0.904	0.096	0.0
FS-165.1	0.464	0.536	0.0
FS-165.2	0.460	0.540	0.0
FS-165.3	0.967	0.033	0.0
FS-165.4	0.621	0.379	0.0
FS-165.5	0.931	0.069	0.0
FS-198	0.996	0.004	0.0
FS-211	0.603	0.397	0.0
FS-214.1	0.406	0.594	0.0
FS-250	0.831	0.169	0.0
FS-260	0.904	0.096	0.0
SBV-001	0.359	0.528	0.113
SBV-002	0.305	0.567	0.128
SBV-003	0.398	0.376	0.225
SBV-004	0.182	0.0	0.818

Data for the "Percent felsic volcanics * Percent quartz+feldspar" scatterplot
Data are in percent, not normalized for the two variables, i.e.,
lvf2pct=(lvf2/total)*100; qfpct=((Q+F)/total)*100.

* Case ID *	LVF2PCT	QFPCT
FS-006	52.434	31.461
FS-081	37.662	54.545
FS-089	11.742	62.121
FS-137.1	38.298	43.262
FS-137.2	9.009	85.135
FS-165.1	47.479	41.176
FS-165.2	41.909	35.685
FS-165.3	3.000	89.000
FS-165.4	36.464	59.669
FS-165.5	6.433	86.550
FS-198	0.365	92.701
FS-211	38.272	58.025
FS-214.1	52.414	35.862
FS-250	14.097	69.163
FS-260	7.111	66.667
SBV-001	50.000	34.000
SBV-002	54.250	29.250
SBV-003	34.250	36.250
SBV-004	0.0	16.500

	Plot group	Type (provided by Pat Gilman)	
FS-006	plain	Tan Plain ware	
FS-081	r/br	Indet R/Br	
FS-089	plain_early	Plain ware (pink hue)	early
FS-137.1	plain	Plain ware (whitish)	
FS-137.2	r/br	Indet R/Br	
FS-165.1	corr	Corrugated (micaceous)	
FS-165.2	corr	Corrugated	
FS-165.3	r/br	Galiuro/Pinaleno R/Br	
FS-165.4	mimbres	Mimbres Classic B/W	
FS-165.5	r/br	Encinas R/Br	
FS-198	plain	Plain ware (red spots)	
FS-211	mimbres	Mimpres Truly Indet	
FS-214.1	cibola	Cibola White ware	
FS-250	plain_early	Plain ware	early
FS-260	plain_early	Plain ware (micaceous)	early
SBV-001	sand		
SBV-002	sand		
SBV-003	sand		
SBV-004	sand		

While these sample sizes, both sherd and sand, are small and the resulting patterns must necessarily be preliminary, it is interesting that none of the sherds appears to be locally made (although this determination depends in part on the geology south of the border in Mexico). The red-on-browns were usually made of granitic temper, and the early plain sherds are different from any other sherds. At this time, it is not possible to distinguish petrographically among the remainder of the painted and plain sherds.

Chipped Stone. The chipped stone that we collected from the Rising site was sorted by raw material and by form (Tables 7 and 8; Appendix 4) because archaeologists have used both characteristics to assess the amount of hunting versus agriculture in the diet. Glassy (obsidian) and cryptocrystalline (chert, chalcedony, jasper) materials are easy to flake into tools such as projectile points, but they are brittle and do not hold an edge. High proportions of these materials in a chipped stone assemblage suggest an emphasis on tool-making; since the only tools in many southwestern assemblages are projectile points, such proportions may indicate an emphasis on hunting. Because of the crystals in their structure, crystalline materials (basalt and other igneous rocks) do not form tools as well, but they do hold an edge. High proportions of crystalline flakes are thus generally seen as an indication of plant processing, which may include agricultural products.

Ideally, we would compare the chipped stone from the earlier Locus B to that from Locus A to see if there were any measurable changes through time in dietary strategies. With only 75 pieces of chipped stone from Locus B, the sample size was small for such an analysis; there were, however, two interesting patterns that appeared. The first was the high proportion of glassy and cryptocrystalline materials in both assemblages, and the second was the fact that the proportion of those materials was higher earlier in time, as we would expect (Table 7). Although the proportion of glassy/cryptocrystallines to crystallines may change according to circumstances, it is common to find that there are more crystallines than any other kind of material (Gilman 1997). In the case of the Rising site, the glassy/crystallines outnumber the crystallines, perhaps because of the local

Table 7. Chipped Stone Raw Materials From the Rising Site.

Provenience	Glassy and Cryptocrystalline		Fine-Grained Basalt and Other Igneous; Quartzite		Course-Grained Basalt and Other Igneous	
	Number	Percent	Number	Percent	Number	Percent
Locus A	611	55.8	368	33.6	116	10.6
Locus B	46	61.3	20	26.7	9	12

Table 8. Chipped Stone Flake Forms From the Rising Site.

Provenience	Primary Flakes		Secondary Flakes		Tertiary Flakes	
	Number	Percent	Number	Percent	Number	Percent
Locus A	78	8.3	209	22.2	655	69.5
Locus B	4	7.4	14	25.9	36	66.7

availability of jasper in a nearby canyon. Regardless of local availability, if people selected the coarse-grained materials with a specific purpose in mind, we would still expect to see a higher proportion of those materials under circumstances of increasing plant use or agriculture. Perhaps suitable sources of crystalline materials are not locally available, and people were using materials that were available. Or perhaps people in this region were simply not practicing the amount of plant processing and agriculture at the same times as other people in the Southwest and northern Mexico. This is an interesting pattern that chipped stone from the Rising site presents, and it is worthy of further investigations.

The fact that, even with the high proportions of glassy/cryptocrystallines from both Locus B and Locus A, there is a higher proportion of these materials earlier in time from Locus B (Table 7) follows the expected pattern of increasing plant processing, presumably agriculture, through time. This part of the analysis must remain tentative because of the small sample size, and again the high proportion of glassy/cryptocrystallines in both assemblages remains tantalizing.

Flake forms are especially diagnostic of the amount of chipped stone reduction that people are doing, and so perhaps diagnostic of the amount of tool making and the need for durable edges. That is, in order to make tools like projectile points, people would have to have flakes or bifaces with not cortex on them, meaning that that core or the biface would have to be reduced to a point where it no longer had cortex. In chipped stone assemblages where the emphasis was on tool making, we would expect a higher proportion of tertiary flakes, which by definition have no cortex, than in assemblages where the emphasis was on plant processing. In the latter, people would have needed durable edges on the flakes for cutting and scraping plant materials, and those edges could be on any kind of flake (although the material is more likely to be crystalline). In such circumstances, people might not go to the effort of making tertiary flakes, and primary and secondary flakes should be more common than in assemblages where tool making is emphasized.

Unfortunately, probably because of the small sample size from Locus B, the analysis of flake forms is ambiguous in terms of dietary change (Table 8). While there is a somewhat higher proportion of primary flakes from the later Locus A, as we would predict, there is also a somewhat higher proportion of tertiary flakes from that locus. Clearly, a larger chipped stone sample from the earlier and perhaps less agricultural Locus B is needed before the results of such an analysis are clear.

Projectile Points. Only five projectile point fragments were recovered from the Rising site (Appendix 5), and all were from the ground surface. People have probably collected artifacts from the site for a hundred years, likely accounting for the paucity of complete points. The five point fragments were made of various materials, including chert, basalt, and obsidian from two sources.

It is interesting to note that some of the projectile points were large enough to have been from the Archaic time periods, while others were small and serrated like Hohokam points. There is no other evidence of Rising site use during the Archaic period, although it may be that we did not find Archaic materials because of our limited excavation or because such materials have eroded away. Alternatively, Archaic points may have been "isolated artifacts" on this later site, or people living at the site may actually have collected them. In the San Simon drainage to the north, Archaic points are common on later sites and as isolated artifacts not associated with sites (Gilman 1997:16).

Obsidian Sourcing by M. Steven Shackley and Patricia A. Gilman. Using energy dispersive x-ray fluorescence, Shackley sourced 25 pieces of obsidian from the Rising site (Table 9). As he notes in his report (Appendix 6), several sources are represented in these materials, including Antelope Wells, Mule Creek, Los Vidrios, and two unknown types. Of the known sources, Antelope Wells is most common and is also closest to the site, straddling the New Mexico-Chihuahua border to the east, about 60 km away. The two pieces of Mule Creek obsidian, including a projectile point, could be from the source in western New Mexico or from secondary deposits 75 to 100 km north in the San Simon

Table 9. Obsidian Sources From the Rising Site.

Provenience	FS#-Sample#	Level	Source	Chipped Stone Form	Comments
N1615 E351	297	surface	chert	core	
N1626 E350	296	surface	not analyzed	angular debris	
N1650 E417	232	surface	Antelope Wells	flake 2	
N1674 E372	252	1	unknown b	core	
N1991 E488	182-1	1	Antelope Wells	flake 2 or 3	
N1991 E488	182-2	1	Mule Creek	flake 2 or 3	
N1991 E488	344	1	unknown b	flake 2	one not analyzed (flake 2)
N1997 E480	8	surface	Antelope Wells	flake 3	
N1997 E484	1-1	surface	chert	?	one not analyzed
N1997 E484	1-2	surface	unknown a	1 nodule	
N1997 E484	1-3	surface	unknown b	2 flake 2; 1 flake 3;	
N1997 E484	300-1	surface	chert	flake 2	
N1997 E484	300-2	surface	unknown b	flake 2	
N1998 E501	247	surface	unknown b	flake 2	
N2011 E520	225-1	surface	unknown a	1 flake 2;	two not analyzed
N2011 E520	225-2	surface	unknown a	2 flake 3;	
N2011 E520	225-3	surface	Los Vidrios	1 angular debris;	
N2011 E520	225-4	surface	unknown b	4 nodules	
N2011 E520	225-5	surface	unknown b		
N2011 E520	225-6	surface	unknown b		
N2012.4 E492.7	248	surface	Mule Creek	projectile point	
N2017.7 E497.3	249	surface	Antelope Wells	flake 2	
N2018 E488	301	1	Antelope Wells	flake 3	
N2023 E504	245	surface	Antelope Wells	projectile point	
N2027 E478	244	surface	Antelope Wells	flake 2	
N2049.25 E524	129	surface	not analyzed	nodule	
N2050 E530 NW Quad	298-1	surface	Antelope Wells	1 flake 2;	
N2050 E530 NW Quad	298-2	surface	unknown a	1 flake 3	
N2050 E530 SE Quad	299	surface	unknown a	thinning flake	
N2053 E537.5	80	surface	unknown a	flake 3	

Key: flake 2=secondary flake; flake 3=tertiary flake

and Safford Valleys. The Los Vidrios source is about 390 km west of the site in Sonora. The two unknown sources are most likely from the Sierra Madre in Sonora and Chihuahua. Thus, the obsidian at the Rising site is from east, west, or south of the site, with only two pieces from the north. This follows a pattern noted for the San Simon Basin where obsidian is also from the east, west, or south and not from the north (Gilman and Shackley n.d.).

No chipped stone form was made from predominantly one obsidian source, including both obsidian projectile points, which were from different sources. The only obsidian core was from the unknown source b, presumably not the source closest to the site. The other artifacts were secondary flakes, tertiary flakes, two pieces of angular debris, one thinning flake, and six nodules. Given the lack of primary flakes, all of these artifacts, including the core, could have been brought onto the site in worked form. The presence of nodules, the form that obsidian raw material takes in this region, is an interesting phenomenon. Although we did not record individual artifact form when we sourced them, the nodules analyzed must be Los Vidrios, unknown a, or unknown b. It is possible that people carried these nodules onto the site, although they are probably too small to use for chipped stone artifacts. Alternatively, they may represent a secondary deposit emanating from unknown source a or b. We did not have a chance to walk around the area near the site looking for naturally occurring obsidian nodules, but extensive secondary deposits of Mule Creek obsidian are present in the San Simon drainage (Gilman and Shackley n.d.; Shackley 1992)

Ground Stone. The materials from which ground stone tools are made can indicate the relative amounts of agricultural products being ground. For example, Lancaster (1983, 1986) argues that, as grinding takes increasing amounts of time, people would use a multistage grinding process by which food was first coarsely ground on a material like vesicular basalt and then more finely ground on a finer grained material like non-vesicular basalt or sandstone. Because the ground stone sample size from our one

week of excavation is quite low, and the sample size for Locus B, the earlier part of the site, is even lower (Appendix 7), we cannot do a comparative analysis. It is interesting to note, however, that there is only one metate fragment made of vesicular basalt, as well as only one sandstone mano fragment. Most of the ground stone raw materials are relatively medium-grained, suggesting only a one stage grinding process at the site.

Ground stone materials may also indicate the movement of raw materials or finished products across the landscape, and this is certainly true at the Rising site. Over half of the manos and metates at the site (Table 10) were granite, which, unless it occurs south of the international border, is not available within about 40 km (25 miles) of the site (Arizona Bureau of Mines 1959). This pattern mirrors that of the petrographic analysis in which some of the sherds, especially the red-on-browns, were tempered with granite. Other common ground stone materials such as basalt and rhyolite could easily be present in the washes draining west from the Chiricahua Mountains, although we did not have time to check local material availability.

Ground stone form can suggest the relative amount of agricultural products in the diet. Archaeologists (Hard 1986, 1990; Lancaster 1983, 1986) generally posit that people used circular manos and small slab or basin metates for less intensive grinding than the grinding for which they used rectangular manos and trough or large slab metates. Sixty-three percent of the Rising site manos were circular or oval (Table 11), while all but two of the metates were definitely slab or basin. Although Locus A at the site was approximately contemporary with the Classic Mimbres period (A.D. 1000-1130) in the Mimbres Valley to the northeast of the project area where the ground stone (Lancaster 1983), among many other indicators, suggests heavy agricultural dependence, the Rising site ground stone hints at much lower dependence on domesticates. The latter is also the case in the San Simon Basin (Gilman 1997:60-69, 131-137), implying some communality within the Chihuahuan Desert.

Plant Remains by Paul E. Minnis, University of Oklahoma Ethnobotanical Laboratory

Table 10. Ground Stone Materials From the Rising Site.

Material	Manos/Pestle	Metates	Indeterminate	Total
Granite	17	13	4	34
Rhyolite	6	3	3	12
Basalt	3	4	3	10
Dacite	1	1	0	2
Sandstone	1	0	0	1
Tuff	1	0	2	3
Basalt/tuff	1	0	0	1
Vesicular Basalt	0	1	0	1
Total	30	22	12	64

Report Number #30. Tables 12, 13, and 14 present the results of the study of 20 flotation samples from the Rising site (also see Appendix 8). Most of this site is badly degraded, and deposits are near the ground surface. Therefore, I did not expect good preservation of prehistoric plant remains, and I was not surprised. The tables are accompanied here by a short discussion of the methodology used to acquire these data and the results of the analysis.

The 20 first priority samples were quite small. Each was weighed and passed through nested geological screens. The entire sample larger than .25 mm was sorted, and the fraction that passed through the .25 mm screen was scanned. All charred propagules were removed as were some uncharred seeds. Given the large number of uncharred and therefore presumably "modern" seeds, many were just counted. I see no appreciable benefit in expending a tremendous effort to retrieve hundreds of uncharred Cheno-Am seeds.

In addition to the 20 first priority flotation samples, there were nine other flotation samples from the Rising site. These were from more ambiguous contexts than the 20 samples and were assumed to be of lesser interpretive value. Therefore, these samples were simply scanned. A scanned sample is examined quickly under magnification looking for unusual or charred items. None were found. A list of scanned samples is included in Appendix 8.

Charred wood fragments larger than 4.0 mm were also studied. Only five of the 20 samples had such wood. As a rule up to 20 pieces of charcoal would be identified from each sample. In practice, however, all wood fragments were identified except for one sample (FS 28) where there were more than 20 pieces of charcoal greater than 4.0 mm. Charcoal samples (FS 24, 116, 138, 185, 255) sent for radiocarbon dating were also identified (Table 13).

Following standard practice, uncharred seeds (Table 14) are assumed to represent modern seeds in the soil unless there is a specific reason to believe otherwise. The charred

Table 11. Ground Stone Forms From the Rising Site.

Mano Form	
Circular	16
Oval	3
Rectangular	6
Unknown	5
Metate Form	
Slab	13
Basin	5
Slab/Basin	2
Circular	1
Unknown	1

Table 12. Charred Propagules From the Rising Site.

FS Number	Provenience	*Chenopodium*	*Amaranthus*	Cheno-Am	*Sporobolus*	Gramineae	Unid. Fragment
20	N1997 E480 L1; F3, 4		1		1		
52	N2018 E 488 L1						1
179	N2049.25 E537 L3						1
180	N1991 E488 L1	1					
190	N2077 E559 L2; F6						1
207	N1997 E480 L2; F3, 4			5		1	4

Chenopodium (goosefoot)
Amaranthus (pigweed)
Cheno-Am (*Chenopodium* or *Amaranthus*)
Sporobolus (dropseed grass)
Gramineae (grass family)
Unid. Fragment (unidentifiable fragment)

Table 13. Wood Charcoal From the Rising Site. FS 24, 116, 138, 185, and 255 were C14 samples.

FS Number	Provenience	*Prosopis*	*Platanus*	*Atriplex*	*Quercus*	*Unknown*	
24	N2028 E459 L2; F1	8	11	1			
27	N2028 E459 13 cm; F1	1	8				
28	N2028 E459 18 cm; F1	10	9	1			
29	N2028 E459 23 cm; F1	4	2				
116	N2037 E503 L2; F5	Pieces too small to identify					
138	N1997 E480	8	2				
185	N2077 E559 L2; F6	15		5			
186	N2077 E559 L1; F6	8		4	1		
190	N2077 E559 L2; F6	12		6		2	
255	N1672 E370 L3					1 (dicot)	
TOTAL		66	32	17	1	3	68
%		55.5	26.9	14.3	.8	2.5	100.0

Provenience. Feature 1 is a protohistoric roasting pit; Feature 5 is a prehistoric roasting pit/hearth; Feature 6 is a protohistoric, historic, or modern roasting pit. **Methodology**. Of the 20 flotation samples in the priority one assemblage, only five had charcoal specimens at least four mm in diameter. Up to 20 pieces from each sample were identified, although only one sample (#28) had more than 20 pieces of charcoal. Specimens were identified with the use of a comparative collection and reference manuals.
Taxa. *Prosopis* (mesquite) is wood that could be either *Prosopis* or *Acacia*. Mesquite is far more common in the area, and so these specimens are most likely mesquite. *Platanus* (sycamore). *Atriplex* (saltbush). *Quercus* (oak).

Table 14. Uncharred Propagules From the Rising Site.

FS#	Cheno-Am	*Portulaca*	*Mullugo*	Aizoaceae	Gramineae	*Prosopis*	Capparidaceae	Other
20	46	103	18	1			3	
27	100s	440		1	20			1 *Opuntia* (c); 5 unknowns
28	140	36						2 unkowns
29	35	8						4 unknowns
46	24					1		1 unknown
52	4	2	3		6			
100	49	12			4			
101	78	18	4		2			
110	100s		4		3	1		
112	32	4						
178	100s		12		7			
179	22	3	1					1 unknown
180	100s	5	34				1	2 *Verbena*
186	100s		1		5			3 *Opuntia* (pp); 4 unknowns
190	49			2	8			38 unknowns
206	5	7	2		1			
207	7							
253	54	17						1 *Euphorbia*; 1 unknown
265	21		57					
279	29	11						1 *Euphorbia*; 12 unknowns

Cheno-Am (*Chenopodium* [goosefoot] and *Amaranthus* [pigweed]). Most of these are *Chenopodium*. *Portulaca* (purslane) is a common weed. *Mullugo* (carpetweed) is a common weed. Aizoaceae is a family with several common weeds. Gramineae (grass family). *Prosopis* (mesquite) - these specimens are mesocarp fragments. Capparidaceae - these specimens are probably *Cleome* (beeweed). *Euphorbia (*spurge) is a common weed. *Verbena* (vervian) is a common genus, many of which are weedy. *Opuntia* (c) is cholla. *Opuntia* (pp) is prickly pear.

seeds are more likely to be prehistoric, although it is certainly possible that they represent naturally burned modern seeds. Either way, the few charred seeds offer little data for analysis (Table 12). All are taxa present in the area, and all are commonly found in archaeobotanical samples.

The taxa present in the wood assemblage (Table 13) are also found in the area today. One interesting pattern is the amount of sycamore in several samples, but sycamore is present today along the Sycamore Creek channel near the south end of the site and at other points along the channel (Gerald Gottfried, personal communication 1999). There is one piece of oak present in the wood assemblage, and today there is a large oak tree about a half mile upstream from the site and another one-and-a-half to two miles to the southeast, again along Sycamore Creek (Gerald Gottfried, personal communication 1999). A second interesting pattern is that the protohistoric roasting pit (Feature 1) had quite a bit of mesquite and sycamore charcoal with only a bit of saltbush, while the roasting pit that could have been protohistoric, historic, or modern (Feature 6) had mostly mesquite charcoal with some saltbush, the only piece of oak, and no sycamore. Although the sample sizes are small and there are only two roasting pits, these data hint at different firewood availability or different wood use and so suggest that Feature 6 may date to the historic or modern period rather than the protohistoric.

Pollen Analysis by Patricia A. Gilman and Suzanne K. Fish. Nine pollen samples were examined (Table 15), of which seven had enough pollen to analyze. The samples were chosen to represent cultural units across Locus A (FS 163, 164, 197, 204), the three pit features (FS 30, 113, 187) which span the prehistoric and perhaps the historic periods, Locus B (FS 264), and a sample from a relatively sterile unit (FS 45) for control. The sample from Feature 6 (FS 187) was taken in Level 1, quite close to the present ground surface, and it may represent the modern pollen in the area.

Most pollen was *Ambrosia*-type, high spine Compositae, Cheno-am, and *Pinus*, and all samples with pollen had some percentage of each. In order of ubiquity, six samples

	FS #	*Ambrosia* -type	High spine Compositae	Cheno-am	Gramineae	*Boerhaavia* -type	*Eriogonum*	*Euphorbia* -type	cf. *Salvia*	*Gilia*	Cruciferae	*Erodium*
N2028, E459 F.1 L.3 23cm	30						INSUFFICIENT POLLEN					
N1942,E418 0-20cm	45	24.5	23.5	19	7		0.5					
N2037,E603 F.5 L.2	113	17.5	17	50.5*		1.5	4					
N1991, E488 L.1 30-40 cm	163	13	3	57*	5.5		8		2			0.5
N2018, E488, 30-50 cm	164						INSUFFICIENT POLLEN					
N2577, E559 F.6 L.1	187	19	12	26*	10.5		3.5			0.5		
N2049.85, E534.25, 24 cm under mano	197	15.5	3.5	67*	4		2	0.5	1.5		1	
N1997.5, E420.45 F.4 L.2 38-44 cm	204	14	6.5	2.5	4	1						
N1672, E370 31 cm	264	25.5	4	51*	3.5	3	6.5					
Percentages of noncultigen pollen types are calculated on the basis of a 200 grain standard sum of all noncultigen pollen.												
Values for cultigen pollen (*Zea*) are given as the number of pollen grains encountered during the tabulation of the 200 grain standarc												
* Indicates a pollen type occurring in aggregates of 6 or more grains.												
+ Inidciates a pollen type observed only in scanning material after tabulation of the 200 grain standard sum.												
Table 15. Pollen results AZ FF:12:48 (ASM)												

	FS #	*Ambrosia* -type	High spine Compositae	Cheno-am	Gramineae	*Boerhaavia* -type	*Eriogonum*	*Euphorbia* -type	cf. *Salvia*	*Gilia*	Cruciferae	*Erodium*	Umbelliferae	Cyperaceae	*Larrea*	*Prosopis*	*Ephedra*	*Pinus*	*Quercus*	*Juniperus*	*Salix*	*Populus*	Indeterminate	*Zea* (no. of grains)
N2028, E459 F.1 L.3 23cm	30						INSUFFICIENT POLLEN																	
N1942,E418 0-20cm	45	24.5	23.5	19	7		0.5										3	6.5	7	2.5	+		6.5	
N2037,E603 F.5 L.2	113	17.5	17	50.5*		1.5	4									1.5*		5	0.5	+		0.5	2	
N1991, E488 L.1 30-40 cm	163	13	3	57*	5.5		8		2			0.5					1.5	2	1				6.5	2*
N2018, E488, 30-50 cm	164						INSUFFICIENT POLLEN																	
N2577, E559 F.6 L.1	187	19	12	26*	10.5		3.5			0.5				0.5		7		4.5	6.5	2	1		7	
N2049.85, E534.25, 24 cm under mano	197	15.5	3.5	67*	4		2	0.5	1.5		1							1		1	0.5		2.5	
N1997.5, E420.45 F.4 L.2 38-44 cm	204	14	6.5	2.5	4	1							0.5				2	2.5	+	2			9	
N1672, E370 31 cm	264	25.5	4	51*	3.5	3	6.5								1.5*		0.5	+	0.5				4	

Percentages of noncultigen pollen types are calculated on the basis of a 200 grain standard sum of all noncultigen pollen.

Values for cultigen pollen (*Zea*) are given as the number of pollen grains encountered during the tabulation of the 200 grain standard sum of all other types.

* Indicates a pollen type occurring in aggregates of 6 or more grains.

+ Inidciates a pollen type observed only in scanning material after tabulation of the 200 grain standard sum.

Table 15. Pollen results AZ FF:12:48 (ASM)

had Graminae, *Eriogonum*, and *Quercus*, while five samples had *Juniperus*, four samples had *Ephedra*, three samples had *Boerhaaiva*-type and *Salix*, and two samples had cf. *Salvia* and *Prosopis*. *Euphorbia*-type, *Gilia*, Cruciferae, *Erodium*, Umbelliferae, Cyperaceae, *Larrea*, *Populus*, and *Zea* were present only in one sample each.

Of the plants represented in the pollen samples, the Forest Service has recorded Graminae and *Prosopis* on and in the immediate vicinity of the site today. There is presently *Quercus* and *Populus* and probably *Salix* and *Juniperus* with two or three kilometers of the site. As well, many of the annuals in the pollen samples may not have been present on the site when Forest Service personnel recorded the plants. It is worth noting that *Pinus* pollen has large bladders, and the wind blows it long distances. The presence of pine pollen does not therefore mean that pine trees were near or on the site in the past.

The only pollen from domesticated plants present in the samples was *Zea* (maize) from one unit (N1991, E488; FS 163) in the center of Locus A. This square had the highest artifact density on the site. The presence of maize pollen clearly suggests that, although the pollen sample was from only 4 to 8 cm below the ground surface, at least some of the pollen dated to the site occupation, since maize pollen is not wind-borne.

One potentially interesting comparison in terms of past environments in between the earlier Locus B and Locus A. The only pollen present in Locus B but not in Locus A is *Larrea* (creosote bush). There are several kinds of pollen present in Locus A samples that are not in the one Locus B sample (Table 15), but interpretation of these possible patterns is hampered by the small number of samples. Analysis of more samples would augment this potentially useful comparison.

Feature 6 had unique pollen and pollen that matches the charcoal from them. This feature (FS 187) was a roasting pit with dates between A.D. 1525 and 1950. Given that many of the samples contained pollen unique to that sample, perhaps it is not surprising

that this one did as well. Feature 6 contained both *Prosopis* and *Quercus* charcoal and pollen.

One pollen sample (FS 197) was taken from beneath a mano in a test trench. The mano was about 10 cm below the present ground surface, and the pollen is perhaps the most likely to be prehistoric on the site. It may be important that the only evidence of Cruciferae pollen came from this provenience.

The pollen present in these samples does not necessarily suggest an environment different in major ways from that present in the site area today. Two caveats, however, must accompany this statement. First, seven samples with pollen is a very small number on which to assess the past environment, and second, because the site is now so shallow, many of the samples may represent the modern rain in the area of the site. Certainly, many more pollen samples, coupled with ethnobotanical samples and assessments of plants present in the area today would be necessary to address the composition of the past environment adequately.

Faunal Remains by Kari M. Schmidt. The small faunal sample (n=192, NISP=28; Table 16; Appendix 9) from the Rising site was collected in the summer of 1997 during mitigation efforts undertaken to assess the impacts of cattle grazing on native revegetation attempts in the area. Units of three types (control, surface collection, and excavation) were placed throughout the site area in a systematic manner to monitor how cattle and planting would alter the landscape.

The bones recovered during the week-long project were analyzed primarily to assess presence and absence data. While a linkage between bones and human behavior always remains the ideal goal, the small sample in this assemblage did not allow for a thorough consideration and development of this link.

Bone identifications were made using the comparative collection at the Oklahoma Archeological Survey in Norman, Oklahoma, and were augmented by osteological manuals when necessary (Cohen and Serjeantson 1996; Gilbert 1993; Lawrence 1951;

Table 16. Summary of Rising Site Archaeofaunal Remains by MNI, NISP, and Percent.

Taxon (Common/Scientific Name)	MNI	NISP	Percent
REPTILES			
Turtles (Order Testudina)			
Indet. Turtle	1	1(*)	3.6
TOTAL REPTILES		1	3.6
MAMMALS			
Lagomorphs (Order Lagomorpha)			
Jackrabbits (*Lepus* sp.)	2	8	28.6
Cottontails (*Sylvilagus* sp.)	2	10	35.7
TOTAL LAGOMORPHS		18	64.3
Rodents (Order Rodentia)			
Indet. Rodent	1	1(*)	3.6
TOTAL RODENTS		1	3.6
Artiodactyls (Order Artiodactyla)			
Deer (*Odocoileus* sp.)	1	1	3.6
Med/lg mammals (cf. Artiodactyl)	1	6	21.3
Artiodactyl	1	1	3.6
TOTAL ARTIODACTYLS		8	28.5
TOTAL IDENTIFIED (Percent identified: 14.6%)		28	100.0
TOTAL UNIDENTIFIED (Percent unidentified: 85.4%)		164	100.0
SITE TOTAL		192	

(* = unburned)

Olsen 1964). The bones recovered from the excavation units were screened through 1/4" and 1/8" mesh and were subjected to standard zooarchaeological procedure (Grayson 1984; Klein and Cruz-Uribe 1984). These procedures included recording the following attributes for each bone: lowest taxonomic identification, element (e.g., tibia, ulna), portion of element present (e.g., proximal, distal, or complete), side (if able to be determined), age (based on presence or absence of epiphyseal fusion line and epiphyses), degree of fusion (fused or unfused), presence and/or degree of burning, natural taphonomic factors (e.g., root-etching, weathering), break patterns (if other than natural), pathologies, and numbers of specimens present. In addition, other surface modifications (e.g., rodent or carnivore gnawing), if present, were also recorded.

Unidentifiable materials classified as mammal were separated based on size. Following Shaffer and Baker's (1992) criteria, distinctions were made between small mammals (small rodents and leporids), medium-sized mammals (large rodents such as beaver, and carnivores such as coyotes and foxes), medium-large sized mammals (deer, pronghorn, and bighorn sheep), and large-sized mammals (elk, bison, and bear). During the analysis, materials not able to be identified to class were noted and classified as unidentifiable. Additionally, unidentifiable shaft fragments were kept separate from unidentifiable, non-shaft fragments in order to assess the number of shaft fragments relative to other unidentifiable fragments in the assemblage to examine which portions of animals were used. Further, methods were employed during the analysis to quantify both the unidentifiable and identifiable remains. These methods include the calculation of NISP (number of identified specimens), MNI (minimum number of individuals), and the leporid and artiodactyl indices.

A total of 192 bones were recovered and analyzed from this assemblage, and most were from Feature 3 (a possible house or activity area) and the adobe chunk area. Of this total, 164 or 85.4 percent were not identifiable to a particular class. Of the 164 unidentifiable specimens, 110 were non-shaft fragments, and 54 were shaft, or long bone,

fragments. Only 28 specimens from the assemblage were identified to a specific class. Of these, 18, or 64.3 percent, were leporids (jackrabbits and cottontails), 1 (3.6 percent) was an indeterminate artiodactyl, 1 was a mule deer (*Odocoileus hemionus*), 6 were medium/large mammal long bone shaft fragments, 1 was an indeterminate turtle, and 1 was an indeterminate rodent. Table 16 and Appendix 9 show the distribution of faunal remains from the Rising Site. The data presented in Appendix 9 includes the unidentifiable fragments while Table 16 summarizes only the identified material. A breakdown of the most represented taxa, the leporids, documents 10 cottontail rabbit remains and 8 jackrabbits specimens (Table 16).

The MNI, or minimum number of individuals, was calculated for each taxon. All taxa were represented by only one individual, except for jackrabbits and cottontails, which were represented by two. This is not surprising given the extremely small sample size. Additionally, both leporid and artiodactyl indices (Bayham and Hatch 1985) were calculated. The leporid index was developed to analyze the ratio of the quantity of cottontail remains to the sum of all leporid remains to assess ecological niches being used. This index is calculated by dividing the total cottontail NISP (S), by the total leporid NISP (S+L). The resulting formula is S/(S+L). The index provides a measure of the relative frequencies of cottontails to jackrabbits in an assemblage. Similarly, the artiodactyl index is used to compare changes in the relative proportions of artiodactyl to leporids through time to assess changing relative abundances. This index is calculated by dividing the NISP of artiodactyls (A) by the sum of the NISP of artiodactyls (A) plus the NISP of leporids (L), resulting in the formula A/(A+L) (Szuter and Bayham 1989).

While small sample sizes in the assemblage weaken the significance of the indices, it is not necessary to dismiss the results completely. The leporid index for the site is 0.55, while the artiodactyl index is 0.1. The leporid index reflects an almost even distribution of jackrabbits to cottontails, with only slightly more emphasis on cottontail rabbits. Similarly, the artiodactyl index reflects a higher number of leporids relative to artiodactyls.

These indices provide information about the relative proportions of cottontails to jackrabbits and the relative abundances of artiodactyls and cottontails.

It is clear that leporids dominate the identified assemblage with slightly over 64 percent. The nearly even distribution of cottontails and jackrabbits indicates that the site area was in close proximity to a brushy, well-watered environment, as well as to an open, sparsely covered vegetal zone. The presence of mule deer supports the use of both ecological niches as well. The single plastron fragment from a turtle closely resembles the western box turtle (*Terrapene ornata*), but this identification was hampered by the small size of the fragment recovered. The identification of this fragment to turtle also supports both a brushy, well-watered environment as well as an open, more arid zone as terrestrial turtles inhabit both areas. The single rodent long bone recovered was not able to be identified beyond order because the portion present, a diastema, was lacking both articular ends and is not helpful in determining ecological conditions in the site area. Further, both the rodent and turtle remains are not burned and were different in overall appearance from the other remains. It is thus possible that these are modern, intrusive specimens.

The results of this analysis seem to be an accurate reflection of the ecological conditions found in the site area today. Although climatic conditions in this region are slightly different than those found prehistorically, the differences lie primarily in degree and not kind. The faunal remains identified are consistent with a desertscrub biotic community, and all species identified can be found in the Chihuahuan desertscrub community that is present in the area today. While interpretations about the significance of the faunal remains from this site are limited by the small sample size, it is possible to assess the relative importance of the taxa present in the assemblage. The remains present indicate that the inhabitants of the site were using two ecological niches, although the lack of identifiable remains does not allow for an in-depth discussion of the relative use of one to the other but only a preliminary consideration. As such, interpretations about their significance are tentative at best.

Summary and Conclusions

This project, although brief, demonstrates that we can learn much from a heavily eroded site, in terms of both management and peoples' lives in the past. The innovative design of the management project suggests that we will gain knowledge about preserving similarly eroded sites as well as other heavily eroded land, and the archaeological monitoring both before and after the cows were placed on the site assures that we will not lose much information about the people who lived here and how they used the landscape. Our archaeological plan allows us to assess the impact of the cows on the site, as well as the possible lessening of erosion encouraged by the growth of native grasses. We were also able to demonstrate that erosion has stripped nearly 20 cm of soil from the site since the current mesquite trees have become established in perhaps the last 20 to 50 years.

The archaeological work at the site provided much information, some of it surprising, about the people who lived here some time between A.D. 225 and 410, again between A.D. 1005 and 1220, a third time between A.D. 1430 and 1670, and perhaps also in the historic or modern periods. Clearly, this is a location useful to people making a living in different ways. Although our sample sizes were generally not large enough to demonstrate it, we would expect people living before the A.D. 1000 to 1200 period as well as during the protohistoric period to be less agricultural, at least until historic/modern times; the evidence from the site suggests that people living between A.D. 1000 and 1200 were not heavily agricultural either.

Locus B, the earliest part of the site, contained only plain wares along with a concomitantly early radiocarbon date of A.D. 225-410. An uncollected Late Archaic San Pedro projectile point fragment and a possible Middle Archaic Gypsum Cave projectile point fragment (FS 233) from the area hint that this part of the site was used through the Archaic period and into the early ceramic period, but excavation data provide information only for the latter. Petrographic analysis suggests that the plain ware sherds from Locus B were made from different sands than those from Locus A, either plain or painted, and that

they were not made from sands in the washes nearest the site. The higher proportion of glassy and cryptocrystalline chipped stone materials than in the later Locus A hints at a chipped stone assemblage that is more focused of tool making than plant processing, but the chipped stone sample size from Locus B is too small to be diagnostic. The concentration of slab and basin metate fragments with a large complete basin metate, a mano, mano fragments, and fragments of indeterminate ground stone in Locus B is intriguing. Many of the fragments were large enough to be used for grinding, and so this is clearly more than just a trash dump. The ground stone and a nearby bedrock mortar may represent the food processing activities that occurred in Locus B, but there is currently no evidence for what people actually ate in terms of ethnobotanical or faunal remains.

Locus A, the main part of the site, dates chronometrically and by the most common painted ceramics to about A.D. 1000 to 1200. There is thus a several hundred year gap in apparent site use between Loci A and B, although there are a few red-on-brown and red-on-white sherds from Locus A that date before A.D. 1000. Remains on this part of the site included a possible house or outside activity area (Feature 3), another possible house represented by a concentration of adobe chunks (N2049.5, E524, E530-538), a hearth or roasting pit (Feature 5), and perhaps a midden area around N1987, E488.

The petrographic analysis suggests that none of the Locus A sherds was tempered with sands from the adjacent washes, a surprising fact, and that some of the sherds were tempered with granitic sand that may occur 25 or more miles away. The petrographic analysis supports the idea that, even in this time when other groups in the Southwest were heavily agricultural, people might have been moving around the landscape over relatively long distances. This statement is augmented by the obsidian sourcing data which show that, even though there was a source within 60 km, people were also obtaining obsidian from more distant sources. In this case, as with the San Simon basin to the north, most of

the obsidian came from sources to the west, south, or east and not to the north. Of course, it is possible that people traded for the obsidian rather than obtaining it directly, as they may also have done for the temper or the pottery vessels.

The ground stone data, and to some degree the chipped stone data, support an interpretation that people were practicing relatively little agriculture compared to other groups to the northeast (the Mimbres Valley) and the northwest (the Hohokam region) and so could easily have been residentially mobile across the landscape. The medium-grained ground stone materials, the dominance of circular/oval manos, and the use of only slab and basin metates support this contention. Further, the most common ground stone material is granite, which was probably also imported into the site. The high proportion of glassy and cryptocrystalline chipped stone in Locus A hints at a chipped stone assemblage focused more on tool making (in this case, projectile points) than on plant/agricultural processing. Although jasper is locally available and composes much of this kind of chipped stone material on the site, people should have chosen crystalline materials if they needed durable edges for their work. What we do not know is whether suitable materials to make flakes with durable edges was available near the site.

Although two grains of corn pollen from the area of highest artifact density are the only evidence of domesticates at the site, these are too few to draw any conclusions about diet. It is worth noting that most of the animal bone from the site came from the areas around Feature 3 and the adobe chunks. Both of these may have been houses at one time, and so the animal bone may be from midden deposits within or near these structures.

Feature 1, a large roasting pit, represents a protohistoric use of the site. The radiocarbon date from charcoal in the pit was A.D. 1430 to 1670, and so the pit could be from either Apache or Sobaipuri use of the area. No burned seeds or animal bone indicated the pit function, although the kinds of wood (sycamore, mesquite or other legume, and a small amount of saltbush) burned in the pit were different from those in Feature 6.

Feature 6 was also a large pit, and the radiocarbon date (A.D. 1525 to 1950) spans the protohistoric, historic, and modern periods. Again, there were no burned seeds or animal bones that would indicate the pit function, but the kinds of wood (mesquite or other legume, saltbush, and one piece of oak) burned suggest that the plants available near the site were different from the time when Feature 1 was used. Specifically, the lack of sycamore in Feature 6 hints that it had been denuded from the nearby wash, and so the pit may have been used in historic or modern times. The charcoal from these two features may be suggestive, but the sample size is not large enough to support any statements about environmental change.

Clearly, there remains much that we could learn from the Rising site, even given its heavily disturbed and eroded state. A larger sample of materials from both parts of the site, but especially from Locus B, would help us compare both how people made a living and the natural environments during each time period. Understanding the context of the ground stone concentration in Locus B would be particularly valuable. A further search for roasting pits and other features might augment the post-A.D. 1200 samples, again with an eye to variations in past economic patterns and the environment. Finally, a broader understanding of other sites in the area and the regional botany, zoology, and geology would illuminate some of the patterns noted here.

Acknowledgments. No archaeological project is successful without the help of many people, and this project is no exception. I first thank Jim McDonald of the Coronado National Forest who invited me to do what turned out to be a pretty interesting project. I also enjoyed working with Mary Farrell, William Gillespie, and Kathy Makanski, also of the Coronado National Forest, as well as Kay Rosenow, Forest Service volunteer extraordinaire, and I thank the Forest Service office in Douglas for providing lab space for the project. I appreciate the interest that Bill McDonald, the landowner and leasee, had in this project.

This project would not have happened without the labor of many volunteers, some of whom are avocational or professional archaeologists and some of whom are students from the University of Oklahoma. They include Brian Andrews, Irma Andrews, George Balluff, Christopher Brooks, James Clanahan, Roy Conner, Robert Heckman, Monica Jones, Wan-jin Kim, Warren Lail, Gene Riggs, Kay Rosenow, Claudia Sauerborn, Phyllis Smith, Patricia Sonneborn, Robert Stokes, and Scott Sundermeyer. As usual, Patricia Lawson ably and efficiently ran the lab, assisted this time by Sandra Fotinos-Riggs.

Kari Schmidt, also ably and efficiently, ran the lab at the University of Oklahoma, did much of the initial artifact analysis, prepared the materials for curation, and did the faunal analysis. Volunteers in the lab included Martha Hildebrand and Jennifer Kovar.

References Cited

Arizona Bureau of Mines

1959 *Geologic Map of Cochise County, Arizona.* Arizona Bureau of Mines, University of Arizona, Tucson.

Bahre, C. J.

1991 *A Legacy of Change.* University of Arizona Press, Tucson.

Bayham, F. E., and P. Hatch

1985 Archaeofaunal Remains From the New River Area. In *Hohokam Settlement and Economic Systems in the Central New River Drainage, Arizona*, edited by D. E. Doyel and M. D. Elson, pp. 405-433. Soil Systems Publication in Archaeology No. 4. Phoenix, Arizona.

Brown, D. E.

1994 Semidesert Grassland. In *Biotic Communities, Southwestern United States and Northwestern Mexico*, edited by D. E. Brown, pp. 123-131. University of Utah Press, Salt Lake City.

Cohen, A., and D. Serjeantson

1996 *A Manual for the Identification of Bird Bones from Archaeological Sites*, Revised Edition. Archetype Publications, London.

Douglas, J. E.

1987 Late Prehistoric Archaeological Remains in the San Bernardino Valley, Southeastern Arizona. *The Kiva* 53:35-52.

1990 *Regional Interaction in the Northern Sierra: An Analysis Based on the Late Prehistoric Occupation of the San Bernardino Valley, Southeastern Arizona.* Unpublished Ph.D. dissertation, Department of Anthropology, University of Arizona, Tucson.

1995 Autonomy and Regional Systems in the Late Prehistoric Southern Southwest. *American Antiquity* 60:240-257.

1996 Distinguishing Change During the Animas Phase (A.D. 1150-1450) at the Boss Ranch Site, Southeastern Arizona. *North American Archaeologist* 17:183-202.

Douglas, J. E., and L. J. Brown

1984 *Archaeological Survey in the San Bernardino Valley, Southeastern Arizona.* Anthropological Resource Center, Cochise College, Douglas, AZ.

1985 *Archaeological Resources in the San Bernardino Valley, Southeastern Arizona.* Anthropological Resource Center, Cochise College, Douglas, AZ.

Fish, P. R., and S. K. Fish
1996 Malpais Borderlands Prehistory. In *Prehistory and Early History of the Malpais Borderlands: Archaeological Synthesis and Recommendations*, by P. R. Fish and S. K. Fish. Ms. submitted to the USDA Forest Service, Tucson.

Gilbert, B. M.
1993 *Mammalian Osteology*. Missouri Archaeological Society, Columbia.

Gilman, P. A.
1997 *Wandering Villagers: Pit Structures, Mobility and Agriculture in Southeastern Arizona*. Arizona State University Anthropological Research Papers No. 49. Tempe.

Gilman, P. A., and M. S. Shackley
n.d. The Temporal Structure of Obsidian Availability and Its Use in Southeastern Arizona. Manuscript on file with the senior author, Department of Anthropology, University of Oklahoma.

Grayson, D. K.
1984 *Quantitative Zooarchaeology: Topics in the Analysis of Archaeological Faunas*. Academic Press, New York.

Hard, R. J.
1986 *Ecological Relationships Affecting the Rise of Farming Economies: A Test From the American Southwest*. Unpublished Ph.D. dissertation, Department of Anthropology, University of New Mexico, Albuquerque.

1990 Agriculture Dependence in the Mountain Mogollon. In *Perspectives on Southwestern Prehistory*, edited by P. E. Minnis and C. L. Redman, pp. 135-149. Westview Press, Boulder, Colorado.

Hastings, J. R., and R. H. Turner
1965 *The Changing Mile*. University of Arizona Press, Tucson.

Klein, R., and K. Cruz-Uribe
1984 *The Analysis of Animal Bones From Archaeological Sites*. University of Chicago Press, Chicago.

Lancaster, J. W.
1983 *An Analysis of Manos and Metates From the Mimbres Valley, New Mexico*. Unpublished Master's Thesis, Department of Anthropology, University of New Mexico, Albuquerque.

Lancaster, J. W.
1986 Ground Stone. In *Short-Term Sedentism in the American Southwest*, by B. A. Nelson and S. A. LeBlanc, pp. 177-190. University of New Mexico Press, Albuquerque.

Lawrence, B.
1951 *Post-Cranial Skeletal Characters of Deer, Pronghorn, and Sheep-Goat with Notes on Bos and Bison.* Reports of the Awatovi Expedition, Papers of the Peabody Museum of American Archaeology and Ethnology, Vol. 35(3). Peabody Museum, Harvard University, Cambridge, MA.

Lowe, C. H.
1964 *Arizona's Natural Environment*. University of Arizona Press, Tucson.

Myers, R. D.
1967 The Folsom Point From the Rising Site, Southeast Arizona. *The Kiva* 32:102-105.

Olsen, S. J.
1964 *Mammal Remains From Archaeological Sites, Part I, Southeastern and Southwestern United States.* Papers of the Peabody Museum of American Archaeology and Ethnology, Vol. 56(1). Peabody Museum, Harvard University, Cambridge, MA.

Shackley, M. S.
1992 The Upper Gila River Gravels as an Archaeological Obsidian Source Region: Implications for Models of Exchange and Interaction. *Geoarchaeology* 7:315-326.

Shaffer, B. S., and B. W. Baker
1992 *A Vertebrate Faunal Analysis Coding System with North American Taxonomy and dBase Support Programs and Procedures*. University of Michigan Museum of Anthropology, Technical Report No. 23. Ann Arbor, Michigan.

Szuter, C. R., and F. E. Bayham
1989 Sedentism and Animal Procurement Among Desert Horticulturalists of the North American Southwest. In *Farmers as Hunter: The Implications of Sedentism*, edited by S. Kent, pp. 80-95. Cambridge University Press, Cambridge, England.

Wilkinson, M. C., T. W. Swetnam, and C. R. Baisan
1996 Climatic Trends for the Malpais Borderlands From the Perspective of Tree Rings. In *Prehistory and Early History of the Malpais Borderlands: Archaeological Synthesis and Recommendations*, edited by P. R. Fish and S. K. Fish. Manuscript on file at the Coronado National Forest, Tucson.

APPENDIX 1

Comparisons of Control, Surface Collection, and Excavation Units Before and After the Experiment

by E. Gene Riggs

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Assessment N 1668 E 368

	Date 7-31-97	Date 3-11-98
Ceramics	—	0
Chipped Stone	1	0
Obsidian	—	0
Ground Stone	—	0
Animal Bone	—	0
Fire-Altered Rock	—	0
Other		

3-11-98
Comments About 1/3 covered by creeper type plant (filaree) tightly matted. Scratched through in several places but no artifacts. None in open area. Cattle disturbance negligible. No deposition or erosion noticed.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Excavated N 1672 E 370

	Date 7-30-97	Date 3-11-98
Ceramics	~~X~~ 3	0
Chipped Stone	~~X~~ 3	1
Obsidian	—	0
Ground Stone	(Lab) 0	0
Animal Bone	—	0
Fire-Altered Rock	—	1
Other		

Comments 3-11-98 Comments of July 97 indicate chipped stone and ceramics. Did not find FS numbers for these. FS number for ground stone. About 1/3 of unit has ground cover (filaree) This unit considerably churned up by cattle. Many hoof impressions remain. No noticible deposition or erosion.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Control N 1674 E 372

	Date 7-30-97/8-1-97	Date 3-11-98
Ceramics	(Lab) 13	2
Chipped Stone	(Lab) 12	4
Obsidian	—	0
Ground Stone	(Lab) 5	0
Animal Bone	—	0
Fire-Altered Rock	—	0
Other		

3-11-98
Comments Slight ground cover - Cresper (filaree)
2 jaspers 1 chert 1 rhyolite
No noticible deposition or erosion.
No FS numbers on form July 97 but comments
indicate ceramics, chipped stone and ground stone.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Assessment N 1934 E 418

	Date 7-30-97	Date 3-19-98
Ceramics	1	1
Chipped Stone	3	2
Obsidian	0	0
Ground Stone	0	0
Animal Bone	0	0
Fire-Altered Rock	0	2
Other		

Comments 3-19-98 About 1/4 of area covered by a creeper plant called filaree. Scratched through in several places but did not locate artifacts there. Very little cattle disturbance. No noticible deposition or erosion.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Control N 1938 E 416 2

	Date 7-30-97	Date 3-19-98
Ceramics	(Lab) 1	0
Chipped Stone	(Lab) 2	0
Obsidian	—	0
Ground Stone	—	0
Animal Bone	—	0
Fire-Altered Rock	—	0
Other		0

Comments FS numbers indicate ceramics and chipped stone. Very little cattle disturbance. No noticible deposition or erosion.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Excavated N 1942 E 418

	Date None on farm (July 30-31?)	Date 3-19-98
Ceramics	—	1
Chipped Stone	(Lab) 1	2
Obsidian	—	0
Ground Stone	—	0
Animal Bone	—	0
Fire-Altered Rock	—	0
Other		

Comments FS number indicates chipped stone
Very little cattle disturbance. Very
little cattle disturbance. No noticible
deposition or erosion.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Assessment N 1987 E 488

	Date 7- -97	Date 3-11-98
Ceramics	355	161
Chipped Stone	225	118
Obsidian	0	0
Ground Stone	2	3
Animal Bone	1	0
Fire-Altered Rock	0	4
Other		

3-11-98
Comments Quite a difference in before and after artifact count. However there are numerous dried muddy hoof prints and a slight ground cover (filaree). The July 97 form indicates numerous small sherds. The Mar. 98 count appears to have 35 to 40% dime size or smaller sherds. No noticible deposition or erosion.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Excavated N 1991 E 488

	Date 7-30/8-1-97	Date 3-11-98
Ceramics	(Lab) 1327	19
Chipped Stone	(Lab)	7
Obsidian	(Lab) 2	0
Ground Stone	(Lab) 11	0
Animal Bone	(Lab) 30	0
Fire-Altered Rock	—	0
Other		

Comments 3-11-98 The excavated unit was very much disturbed by cattle. The loose back fill evidently became very soft and muddy during the rains. No noticible deposition or erosion.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Assessment N 1995 E 476

	Date 7-28-97	Date 3-11-98
Ceramics	33	45
Chipped Stone	16	11
Obsidian	0	0
Ground Stone	2	1
Animal Bone	0	0
Fire-Altered Rock	6	1
Other		

Comments 3-11-98 6 jasper 3 chert 1 chalcedony 1 quartzite
The NW corner of unit is in a small drainage. There appears to be slight erosion in that section. No deposition
About 30% of sherds are dime size or smaller

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Excavated N 1997 E 480

		Date 7-28-97/8-1-97	Date 3-11-98
Ceramics	(Lab)	63	5
Chipped Stone	(Lab)	27	1
Obsidian	(Lab)	1	0
Ground Stone	(Lab)	1	1
Animal Bone	(Lab)	0	0
Fire-Altered Rock		11	0
Other		Burnt Adobe	

Comments 3-11-98 1 jasper
A few cattle tracks are fairly deep in back-fill. No noticible erosion or deposition.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Control N 1997 E 484

	Date 7-28-97	Date 3-11-98
Ceramics	(Lab) 156	8
Chipped Stone	(Lab) 107	3
Obsidian	(Lab) 4	0
Ground Stone	(Lab) 5	1
Animal Bone	(Lab) 1	0
Fire-Altered Rock	0	0
Other		

3-11-98
Comments 2 jasper 1 chert
Not much disturbance by cattle. No noticible deposition or erosion.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Assessment N 2016.5 E 482

	Date 7-29-97	Date 3-19-98
Ceramics	17	6
Chipped Stone	8	5
Obsidian	0	0
Ground Stone	0	0
Animal Bone	0	0
Fire-Altered Rock	0	0
Other		

Comments 3-19-98 1 basalt 1 chert 1 chalcedony 2 jasper
Unit is in drainage. It appears that a slight amount of erosion has occurred. Cattle disturbance not noticible.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Excavated N 2018 E 488

	Date 7-28/7-29-97	Date 3-19-98
Ceramics	(Lab) 25	5
Chipped Stone	(Lab) 6	3
Obsidian	—	0
Ground Stone	—	1
Animal Bone	—	0
Fire-Altered Rock	—	0
Other		

Comments 3-19-98 The unit is partially in a drainage. It appears that a part of the softer back fill material has washed out. (Eroded) Some cattle disturbance is evident.

COTTONWOOD CREEK RANGE EXPERIMENT
(McDonald Ranch Project)
AZ:FF:12:48

Unit Artifact Comparisons

Unit Control N 2023 E 491

	Date 7-29-97	Date 3-19-98
Ceramics	(Lab) 6	1
Chipped Stone	(Lab) 5	2
Obsidian	—	0
Ground Stone	—	0
Animal Bone	—	0
Fire-Altered Rock	—	0
Other		

3-19-98
Comments This unit is on drainage slope. It is covered with hay-straw well trampled into mud. Now dry and hard Scraped through straw as much as possible in several places. Difficult to see artifacts. No noticible deposition or erosion.

APPENDIX 2

Sherd Counts by Provenience and FS Numbers From the Rising Site:
Painted, Corrugated, and Plain Ceramics

Appendix 2. Painted Ceramics From the Rising Site.

Provenience	FS#	Level	Feature	Ind. R/br B	Ind. R/br J	Ind. R/br Ind.	Red B	Red J	Red Ind.	S. Carlos R/br J	Classic B	Truly Ind. B
1965N 433E	78	1	2									
1991N 488E	165	1		19		2	7				2	4
1991N 488E	241	1										1
1997N 480E	6	surface		1				2				
1997N 480E	137	2		1								
1997N 480E	198	2					1					
1997N 480E	21	1										4
1997N 484E	14	surface		2					2	1		
2000N 510E	222	surface										
2018N 488E	74	2										1
2022N 503E	274	surface										
2023N 491E	76	surface		1								
2049.25N 532E	81	surface		2								
2049.25N 532E	167	1										
2049.25N 534E	53	surface		1								
2050N 530E NE Quad	273	surface									1	2
2050N 530E NW Quad	211	surface										4
2050N 530E SE Quad	218	surface			1						1	2
2050N 530E SW Quad	214	surface										1
Total				27	1	2	8	2	2	1	4	19

Key: Ind.=indeterminate
R/br=red-on-brown
B=bowl; J=jar
S. Carlos=San Carlos
W/w=white ware
R/w=red-on-white
Gal/Pin=Galiuro/Pinaleno

Provenience	FS#	Level	Truly Ind. J	Ind. W/w B	Cibola B	Encinas R/br B	Ind. R/w B	Gal/Pin R/br B	Buff Ind.	Comments
1965N 433E	78	1				1				
1991N 488E	165	1			2	4	1	8	1	
1991N 488E	241	1								
1997N 480E	6	surface								
1997N 480E	137	2								
1997N 480E	198	2								Worked edge
1997N 480E	21	1								
1997N 484E	14	surface	1							
2000N 510E	222	surface						1		Thin lines
2018N 488E	74	2								
2022N 503E	274	surface				1				
2023N 491E	76	surface			1					
2049.25N 532E	81	surface								
2049.25N 532E	167	1			1		1			R/w=Cibola paste, slip
2049.25N 534E	53	surface		2						
2050N 530E NE Quad	273	surface				1				
2050N 530E NW Quad	211	surface			1					
2050N 530E SE Quad	218	surface			1	1				
2050N 530E SW Quad	214	surface			2					Truly Ind.=gray slip
Total			1	2	8	8	2	9	1	

Appendix 2. Corrugated Ceramics From the Rising Site.

Provenience	FS#	Level	Feature	Corr. Jar	Corr. Ind.	Red Corr. Ind.	Comments
1991N 488E	165	1		6	121	1	Playas?
1991N 488E	241	1			2		
1991N 488E	338	1			1		
1997N 480E	6	surface			16		
1997N 480E	21	1			20		One corrugated diagonally
1997N 480E	137	2			8		
1997N 480E	198	2			3		One blackened
1997N 480E	315	1			1		Burned
1997N 484E	14	surface			16		
2018N 488E	74	2			1		
2028N 459E	4	1	1		1		
2037N 503E	108	surface	5		8		
2049.25N 524E	191	1			6		
2049.25N 530E	127	surface		1	14		
2049.25N 530E	177	1			11		
2049.25N 530E	276	1			2		
2049.25N 530E	346	1			1		
2049.25N 532E	81	surface			4		
2049.25N 532E	167	1			7		
2049.25N 532E	350	1			1		
2049.25N 534E	58	surface			12		
2049.25N 534E	103	1			12		
2049.25N 534E	334	1			1		
2049.25N 536E	53	1		1	3		
2049.25N 536E	62	surface			7		
2049.25N 538E	31	surface			6		
2049.25N 538E	35	1			8		
2050N 530E NE Quad	273	surface			1		
2050N 530E NW Quad	211	surface		1			
Total				9	294	1	

Appendix 2. Plain Ceramics From the Rising Site.

Provenience	FS#	Level	Feature	Plain Bowl	Plain Jar	Plain Ind.	Tan Jar	Tan Ind.	Incised Ind.	Punc. Ind.	Comments
1672N 370E	97	surface				3					
1672N 370E	158	2			1	2					
1672N 370E	260	3				9					Largest micaceous
1674N 372E	89	surface				13					Some from pot break
1674N 372E	250	1				7					
1938N 418E	72	surface				1					
1965N 433E	69	surface	2			13					Pot break
1965N 433E	78	1	2			4					
1991N 488E	165	1		9	15	1106		3	4	5	Two seed jars
1991N 488E	241	1				3			1		
1991N 488E	338	1				1					
1997N 480E	6	surface		2		39		3			
1997N 480E	21	1		1		54		3			
1997N 480E	198	2				2					One blackened w/ red spots
1997N 480E	315	1				1					
1997N 480E	137	2			1	16		2			
1997N 484E	14	surface		2		131			1		
2018N 488E	51	1				22		3			
2018N 488E	74	2				12					
2022N 503E	274	surface				1					
2023N 491E	76	surface				4					
2028N 459E	4	1	1			2					
2037N 503E	108	surface	5			14					
2037N 503E	109	1	5			3					
2037N 503E	114	2	5			2					
2037N 503E	314	1	5			1					
2049.25N 524E	191	1			1	14			1		
2049.25N 530E	127	surface				24					
2049.25N 530E	177	1				23		1			
2049.25N 530E	276	1				1					Slightly dimpled

Provenience	FS#	Level	Feature	Plain Bowl	Plain Jar	Plain Ind.	Tan Jar	Tan Ind.	Incised Ind.	Punc. Ind.	Comments
2049.25N 532E	81	surface				9					
2049.25N 532E	167	1				19					
2049.25N 534E	58	surface				8					One dimpled
2049.25N 534E	103	1				16			1		
2049.25N 534E	128	surface				4					
2049.25N 536E	53	1				14			1		
2049.25N 536E	62	surface				22		2			
2049.25N 537.57E	66	surface				1					Worked disk frag. w/ drilled hole
2049.25N 537E	171	2				1					
2049.25N 538E	31	surface				10		3			
2049.25N 538E	35	1				15	1	1			
2049.8N 534.32E	196	1				2					
2050N 530E	272	surface				1					Worked edge; disk fragment
Total, Locus A				14	17	1616	1	21	9	5	
Total, Locus B				0	1	35	0	0	0	0	

Key: Punc.=punctate

APPENDIX 3

Preliminary Results From Petrographic Analysis of Sands and Sherds From the San Bernardino Valley, Southeastern Arizona

by Michael Wiley and Elizabeth Miksa

Petrographic Samples From the Rising Site.

FS Number	Provenience	Level	Sherd Type
6	N1997 E480	Surface	Tan plain ware
81	N2049.25 E532	Surface	Indeterminate red-on-brown
89	N1674 E372	Surface	Plain ware (pinkish)
137.1	N1997 E480	2	Plain ware (whitish)
137.2	N1997 E480	2	Indeterminate red-on-brown
165.1	N1991 E488	1	Corrugated (micaceous)
165.2	N1991 E488	1	Corrugated
165.3	N1991 E488	1	Galiuro/Pinaleno Red-on-brown
165.4	N1991 E488	1	Mimbres Classic Black-on-white
165.5	N1991 E488	1	Encinas Red-on-brown
198	N1997 E480	2	Plain ware (red spots)
211	N2050 E530 NW Quad	Surface	Mimbres Truly Indeterminate
214	N2050 E530	Surface	Cibola white ware
250	N1674 E372	1	Plain ware
260	N1672 E370	3	Micaceous plain ware

DESERT ARCHAEOLOGY, INC.
3975 N. Tucson Blvd. Tucson, Arizona 85716
(520) 881-2244 FAX 881-0325
email: arch@desert.com

William H. Doelle, Ph.D.
President

24 April 1998

Dr. Patricia Gilman
Department of Anthropology
University of Oklahoma
Norman, Oklahoma 73019

DESERT ARCHAEOLOGY PETROGRAPHIC REPORT NO. 98-2

Preliminary Results from Petrographic Analysis of Sands and Sherds from the San Bernardino Valley, Southeastern Arizona

This report comprises a brief summary of the point count data for four sands (Table 1) and fifteen sherds (Table 2) that were collected in the San Bernardino Valley, southeastern Arizona and submitted to us for analysis. Please not that we used the sample prefix SBV for the sand samples in place of the prefix RAP, e.g., SBV-001 = RAP-1 etc., since our data base codes are based on geographic place names.

The four sand samples submitted for analysis indicate that the local sand is rich in rhyolite (LVF) and basalt (LVM), along with some biotite-bearing rhyolite (LVFb), quartz (QTZ), and fresh-looking feldspars (KSPAR and PLAG). Sands SBV-001 through SBV-003 contain an average of 43 percent LVF and 14 percent LVM, while SBV-004 contains 74 percent LVM, and no LVF. Table 3 describes the point count parameters used in this analysis.

Many of the sherds are rich in LVF, having up to 47 percent of that grain type. However, a single grain of LVM was counted in only one of the 15 point counted sherds. In addition, sherds FS-137.2, FS-165.3, FS-165.5, and FS-198) are clearly tempered with a granitic sand; they lack the abundant volcanics seen in the four sand samples analyzed thus far.

The geologic map of Arizona (Reynolds 1988) indicates that basalt is available throughout the San Bernardino Valley, and that large granite outcrops do not occur. Based on the data in hand, it is very unlikely that any of the analyzed sherds were produced locally. However, these findings are based solely on the four sands submitted for this project, two of which were collected from the same drainage, and should be considered preliminary at this stage.

Prepared by:

Michael Wiley
Assistant Research Petrologist

Reviewed by:

Elizabeth Miksa
Research Geologist

Reference

Reynolds, Stephen J.
1988 Geological Map of Arizona. Map No. 26. Arizona Geological Survey and United States Geological Survey.

Table 1. Pointcount data for sand collected in the San Bernadino Valley, Southeastern Arizona. Only parameters that were encountered in the sands are included.

Sample	Total	Qtz	Kspar	Plag	Plagal	Px	Amph	Biot	Opaq	Oliv	Lvf	Lvfb	Lvm	Lvv	Lvi	Lsca	Unkn
SBV-001	400	43	50	42	1	1	0	1	1	6	191	9	43	9	0	0	3
SBV-002	400	54	34	29	0	0	0	1	3	3	198	19	49	5	0	3	2
SBV-003	400	41	32	72	0	0	0	1	10	12	123	14	72	7	10	0	6
SBV-004	400	2	1	63	0	2	1	0	5	28	0	0	296	0	0	0	2

Table 2. Poincount data for sherds collected in the San Bernadino Valley, Southeastern Arizona. Only parameters that were encountered in the sherds are included.

Sample	Total	Paste	Qtz	Micr	Kspar	Plag	Plagal	Plaggn	Amph	Biot	Musc	Chlor	Opaq	Lma	Lvf	Lvfb	Lvm	Lvv	Lvh	Unkn
FS-006	267	587	18	0	25	41	0	0	1	7	0	0	7	0	126	14	1	25	0	2
FS-081	154	204	27	0	30	27	0	0	0	3	0	0	4	0	58	0	0	1	0	4
FS-089	264	645	28	0	48	88	0	0	1	12	0	0	7	0	29	2	0	44	0	5
FS-137.1	282	529	20	0	35	67	0	0	0	5	0	0	4	0	104	4	0	39	0	4
FS-137.2	222	348	49	8	39	52	36	5	0	6	0	1	2	0	16	4	0	0	0	4
FS-165.1	238	575	4	0	33	61	0	0	0	1	0	0	6	0	109	4	0	20	0	0
FS-165.2	241	587	13	0	17	56	0	0	0	9	0	0	3	0	91	10	0	42	0	0
FS-165.3	100	187	35	1	25	15	12	1	0	2	0	0	2	1	1	2	0	0	0	3
FS-165.4	181	419	52	0	25	31	0	0	0	0	0	0	2	0	66	0	0	3	0	2
FS-165.5	171	307	62	3	43	14	22	4	1	6	0	0	2	1	11	0	0	0	0	2
FS-198	274	532	52	13	54	100	35	0	0	5	8	3	1	0	1	0	0	0	0	2
FS-211	81	286	20	0	15	12	0	0	0	0	0	0	1	0	28	3	0	1	0	1
FS-214.1	145	357	10	0	2	27	13	0	0	1	0	0	5	0	68	8	0	2	7	2
FS-250	227	695	29	0	41	86	1	0	1	4	0	0	1	0	29	3	0	31	0	1
FS-260	225	536	30	0	41	79	0	0	3	4	0	0	11	0	16	0	0	39	0	2

Table 3. Pointcount parameters used in the petrographic analysis of sand and sherd samples collected in the San Bernardino Valley, southeastern Arizona.

Monomineralic Grains

QTZ	All quartz types. Unstained
KSPAR	Alkali feldspar: Yellow stained potassium feldspars or unstained sodium feldspars, unfeatured or perthitic.
MICR	Microcline: Alkali feldspar with cross-hatch twinning, stained yellow or unstained.
PLAG	Includes calcic plagioclase feldspar (andesine or labradorite, stained pink, commonly with albite or compound twinning, sometimes zoned), and sodic plagioclase feldspar (commonly oligoclase, stained pink, commonly with albite twinning, occasional carlsbad twinning).
PLAGAL	Calcic and sodic plagioclase feldspar grains that have been 10-90 percent altered to sericite, chlorite, or clay minerals.
PLAGGN	Plagioclase feldspar grains that have been >90 percent altered.
MUSC	Sand-sized muscovite mica.
BIOT	Sand-sized biotite mica.
CHLOR	Undifferentiated chlorite group minerals.
PX	Undifferentiated members of the pyroxene group.
AMPH	Undifferentiated members of the amphibole group.
OLIV	Undifferentiated members of the olivine group.
OPAQ	Undifferentiated opaque minerals, not necessarily oxides.
GAR	Undifferentiated members of the garnet group.
EPID	Undifferentiated members of the epidote family.
SPHENE	Sphene. Commonly occurs as rhombic honey-colored grains.
CACO	Undifferentiated sand-sized carbonate minerals (not aggregates).

Volcanic Lithic Fragments

LVF	Felsic volcanic rock: Microgranular nonfelted mosaics of submicroscopic to microscopic quartz and feldspars, commonly with microphenocrysts of feldspar,or quartz, or rarely ferromagnesian minerals. Groundmass is fine to glassy, has well developed potassium feldspar (yellow) stain, may have calcium plagioclase (pink) stain as well. This category represents lavas and tuffs of rhyolite, rhyodacite, dacite, and latite compositions, as well as volcaniclastic felsites.
LVFb	Biotite-bearing felsic volcanic rock.
LVI	Intermediate volcanic rock: Microgranular laths of intermediate feldspar crystals in random to parallel fabric. Commonly intergrown with amphibole and opaque oxides. Rarely traces of yellow stain; usually red stained. Represents intermediate lavas such as latite, andesite or quartz-andesite.
LVM	Matic volcanic rock: laths of feldspar crystals in random to parallel fabric, usually with glassy, devitrified, or otherwise altered dark matrix. Commonly with phenocrysts of opaque oxides, occasionally with quartz, pyroxene or olivine. Rarely yellow stained, usually has well developed pink stain. Represents matic lavas such as basalt or trachyte.

LVV	Glassy volcanic rock: Vitric or vitrophyric grains showing relict shards, pumiceous fabric, welding, or perlitic structure, occasionally with microphenocrysts.
LVH	Hypabyssal volcanic rock: Equigranular anhedral to subhedral feldspar-rich aggregates with no glassy or devitrified groundmass, coarser grained than LVF, generally with yellow and pink stain, representing shallow igneous intrusive rocks.

Sedimentary Lithic Fragments

LSS	Siltstones: Granular aggregates of equant subangular to rounded silt-sized grains with or without interstitial cement. May be well to poorly sorted, with or without sand-sized grains. Composition varies from quartzose to lithic-arkosic. In some cases, interstitial clays altered slightly or recrystallized. This may grade into LMSS.
LSA	Argillite: Dark, extremely fine grained without visible foliation, may have mass extinction, may have variable amounts of silt-sized inclusions. Represents shales, slates, and mudstones.
LSCH	Chert: Microcrystalline aggregates of silica.
LSCA	Carbonate: Mosaics of very fine carbonate crystals with or without interstitial clay- to sand-sized grains.

Metamorphic Lithic Fragments

LMA	Quartz-feldspar (mica) aggregates: Quartz, feldspars, mica, and opaque oxides in aggregates with highly sutured grain boundaries but no planar-oriented fabric. Some represent schists or gneisses viewed on edge, some are undeformed metasediments or metavolcanics.
LMT	Quartz-feldspar-mica tectonite. Grains with strong planar oriented fabric in aggregates of quartz, feldspars, micas, and opaque oxides. Commonly display mineral segregation with alternating quartz-feldspar and mica ribbon. Grains are commonly sutured and/or elongated. These represent the finer grained schists and gneisses.
LMTP	Phyllite: Quartz-feldspar-mica tectonite in which the mica grains are oriented in a planar fabric but are silt-sized or smaller; little or no mineral segregation.
LMSS	Metamorphosed siltstone with oriented micas. Traces of sedimentary textures remain.
LMVF	Metamorphosed felsic volcanic rock commonly with tectonically oriented grains. Traces of phenocrysts and volcanic textures remain.
LMF	Foliated quartz aggregates: Planar-oriented fabric developed in mostly strained quartz crystals with sutured crystallite boundaries. Some quartzite; cataclastic quartz.
LMM	Microgranular quartz aggregates: Nonoriented polygonal aggregates of newly-grown strain-free quartz with sutured, planar, or curved grain boundaries.

Other grain types

UNKN	Unknown. Grains are assigned to this category if they can not be identified, or if they are of rare and sporadic occurrence.

APPENDIX 4

Chipped Stone Counts by Raw Material and Form
From the Rising Site

Appendix 4. Chipped Stone Counts by Raw Material and Form From the Rising Site.

Provenience	FS#	Level	Feature	Obs 2	Obs 3	Obs Th	Obs AD	Obs Core	Obs Nod	F Bas 1	F Bas 2	F Bas 3	F Bas AD	F Bas Core
N1615 E351	224	surface												
N1615 E351	297	surface												
N1626 E350	230	surface												
N1626 E350	296	surface					1							
N1638 E349	234	surface												
N1650 E417	232	surface		1										
N1672 E370	96	surface												
N1672 E370	157	2												
N1672 E370	259	3												
N1672 E370	327	3												
N1674 E372	91	surface												
N1674 E372	154	surface												1
N1674 E372	333	surface												
N1674 E372	251	1										2		
N1674 E372	252	1						1						
N1748 E385	226	surface												
N1757 E385	231	surface												
N1907 E415	227	surface												
N1910 E403	229	surface												
N1929.12 E412.05	102	surface												
N1935.14 E439.7	71	surface												
N1938 E418	73	surface												
N1942 E418	43	1												
N1965 E433	67	surface	2								1			
N1991 E488	151	1								11	18	32	19	1
N1991 E488	182	1		1	1									
N1991 E488	242	1									1			
N1991 E488	344	1		2										
N1997 E480	7	surface												

Provenience	FS#	Level	Feature	Obs 2	Obs 3	Obs Th	Obs AD	Obs Core	Obs Nod	F Bas 1	F Bas 2	F Bas 3	F Bas AD	F Bas Core
N1997 E480	8	surface			1									
N1997 E480	22	1												
N1997 E480	136	2												
N1997 E480	201	2												
N1997 E484	1	surface		2	1				1					
N1997 E484	15	surface								1	4	1		
N1997 E484	300	surface		1										
N1998 E501	247	surface		1										
N2011 E520	225	surface		1	2		1		4					
N2017.7 E497.3	249	surface		1										
N2018 E488	50	1									1	1		
N2018 E488	75	2												
N2018 E488	301	1			1									
N2023 E491	77	surface												
N2027 E478	244	surface		1										
N2028 E459	3	1	1											
N2037 E503	107	surface												
N2049.23 E538	36	1								2	2	2		
N2049.25 E524	129	surface							1					
N2049.25 E524	192	1												
N2049.25 E530	124	surface												1
N2049.25 E530	176	1												
N2049.25 E532	84	surface												
N2049.25 E532	169	1										1		
N2049.25 E534	59	surface									1			
N2049.25 E534	104	1								1	1			
N2049.25 E536	63	surface								1	2	5	2	
N2049.25 E536	54	1										2		
N2049.25 E537	172	2												
N2049.25 E539	32	surface										4		
N2049.5 E530	277	1										1		

Provenience	FS#	Level	Feature	Obs 2	Obs 3	Obs Th	Obs AD	Obs Core	Obs Nod	F Bas 1	F Bas 2	F Bas 3	F Bas AD	F Bas Core
N2050 E530	212	surface	NW Quad											
N2050 E530	298	surface	NW Quad	1	1									
N2050 E530	215	surface	SW Quad								1	1		1
N2050 E530	219	surface	SE Quad											1
N2050 E530	299	surface	SE Quad			1								
N2050 E530	271	surface	NE Quad											
N2052.98 E537.5	80	surface			1									
N2064 E545	223	surface												
N2072 E530	235	surface												
N2075 E540	228	surface												
N2077 E559	189	1	6											
Total				12	8	1	2	1	6	16	32	52	21	5

Key: Obs=obsidian; 2=secondary flake; 3=tertiary flake; Th=thinning flake; Ret=retouch flake; AD=angular debris; Nod=nodule; F Bas=fine-grained basalt; 1=primary flake; FRB=facially retouched biface; C Bas=coarse-grained basalt; F Ig=fine-grained other igneous; Core R=core rejuvenation flake; FRU=facially retouched uniface; C Ig=coarse-grained other igneous; L Cryp=lustrous cryptocrystalline; MRU=marginally retouched uniface; MRB=marginally retouched biface; M Cryp=matte cryptocrystalline

Provenience	FS#	Level	F Bas FRB	C Bas 3	F Ig 1	F Ig 2	F Ig 3	F Ig Ret	F Ig AD	F Ig Core	F Ig Core R	F Ig MRU	F Ig FRU	C Ig 1
N1615 E351	224	surface												
N1615 E351	297	surface												
N1626 E350	230	surface								2				
N1626 E350	296	surface												
N1638 E349	234	surface												
N1650 E417	232	surface												
N1672 E370	96	surface												
N1672 E370	157	2			1	1	1							
N1672 E370	259	3				1	3							1
N1672 E370	327	3					2							
N1674 E372	91	surface				1				1				
N1674 E372	154	surface												
N1674 E372	333	surface												
N1674 E372	251	1				1	2						1	
N1674 E372	252	1												
N1748 E385	226	surface	1											
N1757 E385	231	surface												
N1907 E415	227	surface												
N1910 E403	229	surface												
N1929.12 E412.05	102	surface												
N1935.14 E439.7	71	surface												
N1938 E418	73	surface												
N1942 E418	43	1												
N1965 E433	67	surface				1				1				
N1991 E488	151	1			16	25	92	3	10	3		1		2
N1991 E488	182	1												
N1991 E488	242	1												
N1991 E488	344	1												
N1997 E480	7	surface					3			1				

Provenience	FS#	Level	F Bas FRB	C Bas 3	F Ig 1	F Ig 2	F Ig 3	F Ig Ret	F Ig AD	F Ig Core	F Ig Core R	F Ig MRU	F Ig FRU	C Ig 1
N1997 E480	8	surface												
N1997 E480	22	1				1	2				1			
N1997 E480	136	2					1							
N1997 E480	201	2												
N1997 E484	1	surface												
N1997 E484	15	surface			3	9	9		2		1			4
N1997 E484	300	surface												
N1998 E501	247	surface												
N2011 E520	225	surface												
N2017.7 E497.3	249	surface												
N2018 E488	50	1					1							1
N2018 E488	75	2												
N2018 E488	301	1												
N2023 E491	77	surface					1			1				
N2027 E478	244	surface												
N2028 E459	3	1												
N2037 E503	107	surface							2					
N2049.23 E538	36	1			1		6							
N2049.25 E524	129	surface												
N2049.25 E524	192	1												
N2049.25 E530	124	surface				1								
N2049.25 E530	176	1				1	1							
N2049.25 E532	84	surface								1				1
N2049.25 E532	169	1												1
N2049.25 E534	59	surface					2							
N2049.25 E534	104	1		1			1							1
N2049.25 E536	63	surface				1	4			1				1
N2049.25 E536	54	1			1	2	2							1
N2049.25 E537	172	2												
N2049.25 E539	32	surface				2	8			1				
N2049.5 E530	277	1												

Provenience	FS#	Level	F Bas FRB	C Bas 3	F Ig 1	F Ig 2	F Ig 3	F Ig Ret	F Ig AD	F Ig Core	F Ig Core R	F Ig MRU	F Ig FRU	C Ig 1
N2050 E530	212	surface				1								
N2050 E530	298	surface												
N2050 E530	215	surface												
N2050 E530	219	surface											1	
N2050 E530	299	surface												
N2050 E530	271	surface								1				
N2052.98 E537.5	80	surface												
N2064 E545	223	surface					1							
N2072 E530	235	surface												
N2075 E540	228	surface												
N2077 E559	189	1												
			1	1	22	48	142	3	14	13	2	1	2	13

Provenience	FS#	Level	C Ig 2	C Ig 3	C Ig AD	C Ig Core	C Ig Core R	Quartzite 2	Quartzite 3	L Cryp 1	L Cryp 2	L Cryp 3	L Cryp Th
N1615 E351	224	surface											
N1615 E351	297	surface											
N1626 E350	230	surface											
N1626 E350	296	surface											
N1638 E349	234	surface											
N1650 E417	232	surface											
N1672 E370	96	surface		2								1	
N1672 E370	157	2			1					2	1	2	
N1672 E370	259	3	2	1							2		1
N1672 E370	327	3											
N1674 E372	91	surface										3	
N1674 E372	154	surface											
N1674 E372	333	surface										1	
N1674 E372	251	1	2								2	3	
N1674 E372	252	1											
N1748 E385	226	surface											
N1757 E385	231	surface											
N1907 E415	227	surface											
N1910 E403	229	surface		1									
N1929.12 E412.05	102	surface											
N1935.14 E439.7	71	surface											
N1938 E418	73	surface									1	1	
N1942 E418	43	1											
N1965 E433	67	surface										2	
N1991 E488	151	1	17	19		4		1	7	21	62	241	3
N1991 E488	182	1											
N1991 E488	242	1		1									1
N1991 E488	344	1											
N1997 E480	7	surface		2							2	6	

Provenience	FS#	Level	C Ig 2	C Ig 3	C Ig AD	C Ig Core	C Ig Core R	Quartzite 2	Quartzite 3	L Cryp 1	L Cryp 2	L Cryp 3	L Cryp Th
N1997 E480	8	surface											
N1997 E480	22	1		1	1					1			
N1997 E480	136	2										2	
N1997 E480	201	2									1		
N1997 E484	1	surface											
N1997 E484	15	surface	3	13	4		1	1	1	1	5	23	
N1997 E484	300	surface									1		
N1998 E501	247	surface											
N2011 E520	225	surface											
N2017.7 E497.3	249	surface											
N2018 E488	50	1				1							
N2018 E488	75	2	2										
N2018 E488	301	1											
N2023 E491	77	surface	1									2	
N2027 E478	244	surface											
N2028 E459	3	1									1		
N2037 E503	107	surface											
N2049.23 E538	36	1		4	1					1	1	11	
N2049.25 E524	129	surface											
N2049.25 E524	192	1				1			1				
N2049.25 E530	124	surface	1	1						1		1	
N2049.25 E530	176	1	2	2								1	
N2049.25 E532	84	surface		2									
N2049.25 E532	169	1	1						1		1	3	
N2049.25 E534	59	surface										4	
N2049.25 E534	104	1		1							1	5	
N2049.25 E536	63	surface		10	1						2	5	
N2049.25 E536	54	1		4						1	2	2	
N2049.25 E537	172	2							1				
N2049.25 E539	32	surface									1	2	
N2049.5 E530	277	1		1								1	

Provenience	FS#	Level	C Ig 2	C Ig 3	C Ig AD	C Ig Core	C Ig Core R	Quartzite 2	Quartzite 3	L Cryp 1	L Cryp 2	L Cryp 3	L Cryp Th
N2050 E530	212	surface							1				
N2050 E530	298	surface											
N2050 E530	215	surface											
N2050 E530	219	surface											
N2050 E530	299	surface											
N2050 E530	271	surface											
N2052.98 E537.5	80	surface											
N2064 E545	223	surface											
N2072 E530	235	surface											
N2075 E540	228	surface											
N2077 E559	189	1											
			31	65	8	6	1	2	12	28	86	322	5

Provenience	FS#	Level	L Cryp Ret	L Cryp AD	L Cryp Core	L Cryp Core R	L Cryp MRU	L Cryp MRB	L Cryp FRU	L Cryp FRB
N1615 E351	224	surface								1
N1615 E351	297	surface			1					
N1626 E350	230	surface								1
N1626 E350	296	surface								
N1638 E349	234	surface								
N1650 E417	232	surface								
N1672 E370	96	surface								
N1672 E370	157	2								
N1672 E370	259	3								1
N1672 E370	327	3								
N1674 E372	91	surface		2	1					
N1674 E372	154	surface								
N1674 E372	333	surface								
N1674 E372	251	1			1	1				
N1674 E372	252	1								
N1748 E385	226	surface								
N1757 E385	231	surface								
N1907 E415	227	surface					1			
N1910 E403	229	surface								
N1929.12 E412.05	102	surface						1		
N1935.14 E439.7	71	surface						1		
N1938 E418	73	surface								
N1942 E418	43	1								
N1965 E433	67	surface								
N1991 E488	151	1	8	9	16	3	4			
N1991 E488	182	1								
N1991 E488	242	1								
N1991 E488	344	1								
N1997 E480	7	surface		1	1					

Provenience	FS#	Level	L Cryp Ret	L Cryp AD	L Cryp Core	L Cryp Core R	L Cryp MRU	L Cryp MRB	L Cryp FRU	L Cryp FRB
N1997 E480	8	surface								
N1997 E480	22	1								
N1997 E480	136	2								
N1997 E480	201	2								
N1997 E484	1	surface								
N1997 E484	15	surface			2					
N1997 E484	300	surface								
N1998 E501	247	surface								
N2011 E520	225	surface								
N2017.7 E497.3	249	surface								
N2018 E488	50	1								
N2018 E488	75	2								
N2018 E488	301	1								
N2023 E491	77	surface								
N2027 E478	244	surface								
N2028 E459	3	1								
N2037 E503	107	surface								
N2049.23 E538	36	1		1						
N2049.25 E524	129	surface								
N2049.25 E524	192	1								
N2049.25 E530	124	surface								
N2049.25 E530	176	1								
N2049.25 E532	84	surface								
N2049.25 E532	169	1								
N2049.25 E534	59	surface								
N2049.25 E534	104	1								
N2049.25 E536	63	surface		1						
N2049.25 E536	54	1			1					
N2049.25 E537	172	2								
N2049.25 E539	32	surface								
N2049.5 E530	277	1								

Provenience	FS#	Level	L Cryp Ret	L Cryp AD	L Cryp Core	L Cryp Core R	L Cryp MRU	L Cryp MRB	L Cryp FRU	L Cryp FRB
N2050 E530	212	surface						1		
N2050 E530	298	surface								
N2050 E530	215	surface								
N2050 E530	219	surface								
N2050 E530	299	surface								
N2050 E530	271	surface								
N2052.98 E537.5	80	surface								
N2064 E545	223	surface								
N2072 E530	235	surface							1	
N2075 E540	228	surface					1			
N2077 E559	189	1								
			8	14	23	4	6	3	1	3

Provenience	FS#	Level	M Cryp 1	M Cryp 2	M Cryp 3	M Cryp Th	M Cryp AD	M Cryp Core	M Cryp MRU	M Cryp MRB	Total
N1615 E351	224	surface									1
N1615 E351	297	surface									1
N1626 E350	230	surface									3
N1626 E350	296	surface									1
N1638 E349	234	surface								1	1
N1650 E417	232	surface									1
N1672 E370	96	surface									3
N1672 E370	157	2			2						11
N1672 E370	259	3			3			1			16
N1672 E370	327	3			2						4
N1674 E372	91	surface		1	2						11
N1674 E372	154	surface									1
N1674 E372	333	surface									1
N1674 E372	251	1			4						19
N1674 E372	252	1									1
N1748 E385	226	surface			1						2
N1757 E385	231	surface								1	1
N1907 E415	227	surface									1
N1910 E403	229	surface									1
N1929.12 E412.05	102	surface									1
N1935.14 E439.7	71	surface									1
N1938 E418	73	surface									2
N1942 E418	43	1			1						1
N1965 E433	67	surface									5
N1991 E488	151	1	1	2	30			6			687
N1991 E488	182	1									2
N1991 E488	242	1									3
N1991 E488	344	1									2
N1997 E480	7	surface		2	4		1	4			27

Provenience	FS#	Level	M Cryp 1	M Cryp 2	M Cryp 3	M Cryp Th	M Cryp AD	M Cryp Core	M Cryp MRU	M Cryp MRB	Total
N1997 E480	8	surface									1
N1997 E480	22	1		1	4						12
N1997 E480	136	2			1						4
N1997 E480	201	2									1
N1997 E484	1	surface									4
N1997 E484	15	surface	2	1	14			2			107
N1997 E484	300	surface									2
N1998 E501	247	surface									1
N2011 E520	225	surface									8
N2017.7 E497.3	249	surface									1
N2018 E488	50	1							1		6
N2018 E488	75	2									2
N2018 E488	301	1									1
N2023 E491	77	surface									5
N2027 E478	244	surface									1
N2028 E459	3	1									1
N2037 E503	107	surface									2
N2049.23 E538	36	1		1	3						36
N2049.25 E524	129	surface			1						2
N2049.25 E524	192	1		1	3			1			7
N2049.25 E530	124	surface					1				7
N2049.25 E530	176	1									7
N2049.25 E532	84	surface			1						5
N2049.25 E532	169	1									8
N2049.25 E534	59	surface			3						10
N2049.25 E534	104	1			1						13
N2049.25 E536	63	surface		3	4	1					44
N2049.25 E536	54	1			1						19
N2049.25 E537	172	2									1
N2049.25 E539	32	surface			2						20
N2049.5 E530	277	1									3

Provenience	FS#	Level	M Cryp 1	M Cryp 2	M Cryp 3	M Cryp Th	M Cryp AD	M Cryp Core	M Cryp MRU	M Cryp MRB	Total
N2050 E530	212	surface									3
N2050 E530	298	surface									2
N2050 E530	215	surface									3
N2050 E530	219	surface									2
N2050 E530	299	surface									1
N2050 E530	271	surface									1
N2052.98 E537.5	80	surface									1
N2064 E545	223	surface									1
N2072 E530	235	surface									1
N2075 E540	228	surface									1
N2077 E559	189	1			2						2
			3	12	89	1	2	14	1	2	1170

APPENDIX 5

Projectile Points From the Rising Site

Appendix 5. Projectile Points From the Rising Site. All measurements are in cm. All are from the surface.

Provenience	FS#	Point Type	Material	Length	Thick.	Weight (g)	Blade Length	Blade Width	Stem Length	Stem Thick.	Min. Stem Width	Max. Stem Width
N1657 E414	233	Gypsum Cave?	chert	1.8+	0.5	1.2+	nd	nd	1.8+	0.5	0.4	1.2
N1896 E417	236	Late Archaic?	basalt	2.3+	0.7	4.7+	2.3+	2.7	nd	nd	nd	nd
N1997.8 E498	246	Late? Hohokam?	lustrous chert	2.2+	0.2	0.4+	2.2+	0.9	nd	nd	nd	nd
N2012.4 E492.7	248	Hohokam?	Mule Creek obsidian	1.9+	0.3	0.4+	1.9+	0.8	nd	nd	nd	nd
N2023.8 E504	245	?	Antelope Wells obsidian	1.1+	0.5	0.7+	nd	nd	na	na	na	na

Key: nd=no data
Thick.=thickness
Min.=minimum
Max.=maximum
na=not applicable
Grind=grinding

Provenience	FS#	Stem Shape	Base Width	Base Shape	Basal Grind	Notching	Serrated	Breakage	Notes
N1657 E414	233	contracting	na	na	no	nd	no	stem only	could be blade frag. instead of stem
N1896 E417	236	nd	nd	nd	nd	nd	no	blade only	
N1997.8 E498	246	nd	nd	nd	nd	nd	yes	blade only	unifacially flaked on opposite sides; unfinished?
N2012.4 E492.7	248	nd	nd	nd	nd	nd	yes	blade only	tip broken
N2023.8 E504	245	na	1.6	convex	no	nd	nd	base only	

APPENDIX 6

An Energy Dispersive X-Ray Fluorescence (EDXRF) Analysis of Obsidian Artifacts From AZ FF:12:48 (ASM), Southeastern Arizona

by M. Steven Shackley

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO

SANTA BARBARA • SANTA CRUZ

ARCHAEOLOGICAL X-RAY FLUORESCENCE SPECTROMETRY LABORATORY
PHOEBE HEARST MUSEUM OF ANTHROPOLOGY
103 KROEBER HALL

BERKELEY, CALIFORNIA 94720-3712
USA

AN ENERGY DISPERSIVE X-RAY FLUORESCENCE (EDXRF) ANALYSIS OF OBSIDIAN ARTIFACTS FROM AZ FF 12:48 (ASM), SOUTHEASTERN ARIZONA

by

M. Steven Shackley, Ph.D.
Director

Report Prepared for

Dr. Patricia Gilman
Department of Anthropology
University of Oklahoma, Norman

30 September 1997

INTRODUCTION

The following report documents the EDXRF analysis of 25 obsidian and three chert artifacts recovered from AZ FF:12:48(ASM) near Douglas, Arizona. The source provenance of the obsidian is quite diverse, including a number of, as yet, unlocated sources most likely from the Sierra Madre in Sonora and Chihuahua, based on unpublished research performed by this laboratory. The remaining artifacts were produced from obsidian procured from Los Vidrios, Sonora, Antelope Wells, New Mexico and Chihuahua, and Mule Creek in either eastern Arizona or western New Mexico.

ANALYSIS AND INSTRUMENTATION

All samples were analyzed whole without formal sample preparation. The results presented here are quantitative in that they are derived from "filtered" intensity values ratioed to the appropriate x-ray continuum regions through a least squares fitting formula rather than plotting the proportions of the net intensities in a ternary system (McCarthy and Schamber 1981; Schamber 1977). Or more essentially, these data through the analysis of international rock standards, allow for inter-instrument comparison with a predictable degree of certainty (Hampel 1984).

The trace element analyses were performed in the Department of Geology and Geophysics, University of California, Berkeley, using a Spectrace™ 400 (United Scientific Corporation) energy dispersive x-ray fluorescence spectrometer. The spectrometer is equipped with a Rh x-ray tube, a 50 kV x-ray generator, with a Tracor X-ray (Spectrace™) TX 6100 x-ray analyzer using an IBM PC based microprocessor and Tracor reduction software. The x-ray tube was operated at 30 kV, 0.20 mA, using a 0.127 mm Rh primary beam filter in a vacuum path at 250 seconds livetime to generate x-ray intensity Kα-line data for elements titanium (Ti),

manganese (Mn), iron (as Fe^T), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), and niobium (Nb). Weight percent iron ($Fe_2O_3{}^T$) can be derived by multiplying ppm estimates by 1.4297^{10-4}. Trace element intensities were converted to concentration estimates by employing a least-squares calibration line established for each element from the analysis of international rock standards certified by the National Institute of Standards and Technology (NIST), the US. Geological Survey (USGS), Canadian Centre for Mineral and Energy Technology, and the Centre de Recherches Pétrographiques et Géochimiques in France (Govindaraju 1989). Further details concerning the petrological choice of these elements in Southwest obsidians is available in Shackley (1988, 1990, 1992, 1995; also Mahood and Stimac 1991; and Hughes and Smith 1993). Specific standards used for the best fit regression calibration for elements Ti through Nb include G-2 (basalt), AGV-1 (andesite), GSP-1 and SY-2 (syenite), BHVO-1 (hawaiite), STM-1 (syenite), QLM-1 (quartz latite), RGM-1 (obsidian), W-2 (diabase), BIR-1 (basalt), SDC-1 (mica schist), TLM-1 (tonalite), SCO-1 (shale), all US Geological Survey standards, and BR-N (basalt) from the Centre de Recherches Pétrographiques et Géochimiques in France (Govindaraju 1989). In addition to the reported values here, Pb, Ni, Cu, Zn, Ga, and Th were measured, but these are rarely useful in discriminating glass sources and are not generally reported. These data are available on disk by request.

The data from the Tracor software were translated directly into Quattro Pro for Windows software for manipulation and on into SPSS for Windows for statistical analyses. In order to evaluate these quantitative determinations, machine data were compared to measurements of known standards during each run. Table 1 shows a comparison between values recommended for three international obsidian and rhyolite rock standards, RGM-1, NBS(SRM)-278, and JR-2.

One of these standards is analyzed during each sample run to check machine calibration. The results shown in Table 1 indicate that the machine accuracy is quite high, particularly for the mid-Z elements, and other instruments with comparable precision should yield comparable results. Further information on the laboratory instrumentation can be found on the World Wide Web at: <http://obsidian.pahma.berkeley.edu/xrflab.htm>.

Trace element data exhibited in Tables 1 and 2 are reported in parts per million (ppm), a quantitative measure by weight. Table 2 and Figures 1-3 exhibit the data for the archaeological samples. Bivariate and trivariate separation of specimens is possible using four elements: Ti, Rb, Sr, and Zr (Figures 2 and 3). Separation of assigned Antelope Wells artifacts and "unknown a" artifacts is based on 5% variability of Antelope Wells source data. The low Rb Antelope Wells specimen is a provisional assignment, and could be another unknown peralkaline obsidian in the region. The "unknown a" group appears to be bimodal in Rb, or may be the result of two different magma sources. Absence of source standards frustrates assignments at this time.

DISCUSSION

While the source provenance of the obsidian artifacts from the site is quite diverse, all but one of the artifacts were produced from obsidian on or south of the modern international border (Table 2 and Figure 1). The one specimen produced from Mule Creek glass could actually have been procured in the San Simon or Safford Valleys approximately 75 to 100 km north (Shackley 1995). What is most intriguing about the data set, is the presence of peralkaline and calc-alkaline obsidian sources that have been detected in sites along the eastern scarp of the Sierra Madre in Chihuahua from the Donald Brand and Richard Brooks collections housed at the Hearst Museum of Anthropology (see Table 2, and Figures 2 and 3). Additionally, a recent analysis of obsidian

cruciforms from Chihuahua and Texas also detected the presence of what is called "unknown b" here, and designated "Unknown C" in that study (Shackley 1997). These sources, and many more are present in large quantities in sites in Chihuahua, and many are quite distinctive as peralkaline glasses, like the Antelope Wells obsidian, and quite different from the calc-alkaline obsidians north of the border. Additionally, preliminary work by the Lakehead University group and our lab here at Berkeley suggests that these obsidians do not appear to move north and south, but do appear to have been exchanged/procured east and west (Joe Stewart, personal communication 1997). Until we can locate the primary and secondary sources of these glasses, the inferences will remain weak. This small sample does, however, support that model in that most of the known sources in the assemblage are from east or west, and only one (Mule Creek) is from the north.

The presence of a dark brown to black chert source in the collection may indicate an important source of this apparently fine-grained chert in the region. While the nodules in this collection appear small, they do appear to have been selected for reduction and tool production. Their megascopic resemblance to obsidian is quite close, and further suggests the fine-grained quality of the material.

REFERENCES CITED

Glascock, Michael D.
1991 *Tables for Neutron Activation Analysis* (3rd edition). The University of Missouri Research Reactor Facility.

Glascock, M.D., and M.P. Anderson
1993 Geological Reference Materials for Standardization and Quality Assurance of Instrumental Neutron Activation Analysis. *Journal of Radioanalytical and Nuclear Chemistry* 174(2):229-242.

Govindaraju, K.
1989 1989 Compilation of Working Values and Sample Description for 272 Geostandards. *Geostandards Newsletter* 13 (special issue).

Hampel, Joachim H.
1984 Technical Considerations in X-ray Fluorescence Analysis of Obsidian. In *Obsidian Studies in the Great Basin*, edited by R.E. Hughes, pp. 21-25. Contributions of the University of California Archaeological Research Facility 45. Berkeley.

Hughes, Richard E., and Robert L. Smith
1993 Archaeology, Geology, and Geochemistry in Obsidian Provenance Studies. *In Scale on Archaeological and Geoscientific Perspectives*, edited by J.K. Stein and A.R. Linse, pp. 79-91. Geological Society of America Special Paper 283.

Mahood, Gail A., and James A. Stimac
1990 Trace-Element Partitioning in Pantellerites and Trachytes. *Geochemica et Cosmochimica Acta* 54:2257-2276.

McCarthy, J.J., and F.H. Schamber
1981 Least-Squares Fit with Digital Filter: A Status Report. In *Energy Dispersive X-ray Spectrometry*, edited by K.F.J. Heinrich, D.E. Newbury, R.L. Myklebust, and C.E. Fiori, pp. 273-296. National Bureau of Standards Special Publication 604, Washington, D.C.

Schamber, F.H.
1977 A Modification of the Linear Least-Squares Fitting Method which Provides Continuum Suppression. In *X-ray Fluorescence Analysis of Environmental Samples*, edited by T.G. Dzubay, pp. 241-257. Ann Arbor Science Publishers.

Shackley, M. Steven
1988 Sources of Archaeological Obsidian in the Southwest: An Archaeological, Petrological, and Geochemical Study. *American Antiquity* 53(4):752-772.

1990 *Early Hunter-Gatherer Procurement Ranges in the Southwest: Evidence from Obsidian Geochemistry and Lithic Technology*. Ph.D. dissertation, Arizona State University. University Microfilms, Ann Arbor.

1992 The Upper Gila River Gravels as an Archaeological Obsidian Source Region: Implications for Models of Exchange and Interaction. *Geoarchaeology* 7(4):315-326.

1995 Sources of Archaeological Obsidian in the Greater American Southwest: An Update and Quantitative Analysis. *American Antiquity* 60(3):531-551.

1997 An Energy Dispersive X-Ray Fluorescence (EDXRF) Analysis of Kaake and Phelps Collection Obsidian Cruciforms from Texas and Chihuahua. Report prepared for Jeff Kaake, El Paso, Texas.

Table 1. X-ray fluorescence concentrations for selected trace elements of three international rock standards. ± values represent first standard deviation computations for the group of measurements. All values are in parts per million (ppm) as reported in Govindaraju (1989) and this study. RGM-1 is a U.S. Geological Survey rhyolite standard, NBS (SRM)-278 is a National Institute of Standards and Technology obsidian standard, and JR-2 is a Geological Survey of Japan rhyolite standard. Fe^T can be converted to $Fe_2O_3{}^T$ with a multiplier of 1.4297(10-4) (see also Glascock 1991).

SAMPLE	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Ba
RGM-1 (Govindaraju 1989)	1600	279	12998	149	108	25	219	8.9	807
RGM-1 (Glascock and Anderson 1993)	1800±200	323±7	12400±300	145±3	120±10	n.r.[a]	150±7	n.r.	826±31
RGM-1 (this study)	1516±58	259±19	13991±143	152±3	108±2	24±1	226±4	10±1	806±12
SRM-278 (Govindaraju 1989)	1469	402	14256	127.5	63.5	41	295	n.r.	1140
SRM-278 (Glascock and Anderson 1993)	1460±270	428±8	14200±300	128±4	61±15	n.r.	208±20	n.r.	891±39
SRM-278 (this study)	1376±96	372±17	15229±399	129±2	68±2	42±2	290±3	17±2	1090±38
JR-2 (Govindaraju 1989)[b]	540	852	6015	297	8	51	98.5	19.2	39
JR-2 (this study)	343±51	680±17	7358±65	300±5	10±1	49±3	94±2	16±2	34±6

[a] n.r. = no report; n.m.=not measured

[b] values proposed not recommended

Table 2. Elemental concentrations and source assignments for archaeological specimens. All measurements in parts per million (ppm).

SAMPLE	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb	Source
1-1	4672.6	841.1	135542.6	4.7	0.0	11.6	0.0	0.0	not obsidian*
1-2	2480.2	777.3	17174.3	226.0	3.3	84.2	778.3	48.7	unknown a*
1-3	1394.4	662.7	9743.9	291.8	2.6	55.7	173.0	41.0	unknown b
247	1096.0	666.8	9598.9	324.9	4.3	58.6	188.5	43.4	unknown b
300-1	11857.0	850.7	46286.9	8.2	63.6	15.5	59.7	0.0	not obsidian
300-2	1331.3	687.3	9796.4	315.5	1.0	60.9	189.9	44.7	unknown b
248	968.4	298.3	9952.0	231.0	15.6	38.0	118.3	24.6	Mule Creek
252	1118.1	678.2	9461.2	313.1	2.4	57.2	187.1	44.1	unknown b
225-1	2227.0	674.9	15753.7	212.0	9.4	94.1	893.2	68.8	unknown a
225-2	2004.2	716.4	17554.6	225.7	3.6	92.9	909.7	71.3	unknown a
225-3	1087.5	592.2	8369.4	262.2	0.0	60.8	204.5	35.6	Los Vidrios
225-4	1076.8	883.9	11340.5	365.1	0.1	67.7	208.4	52.6	unknown b
225-5	1561.0	629.1	9224.6	288.4	0.0	60.7	161.0	32.0	unknown b
225-6	971.4	673.9	9569.0	326.2	2.9	68.5	210.6	42.1	unknown b
344-1	1200.8	705.8	9718.4	307.4	2.5	54.8	185.6	40.0	unknown b
8	1910.2	885.8	20942.6	318.9	3.4	116.4	1098.7	80.1	Antelope Wells
298-1	1655.2	867.0	22388.9	329.2	5.0	126.7	1169.6	90.9	Antelope Wells
298-2	1969.0	932.6	21912.0	299.9	5.8	104.2	993.6	79.3	unknown a
299	2596.1	980.7	22098.7	278.4	11.5	84.3	863.2	60.6	unknown a
232	1510.4	906.3	21277.7	333.4	3.5	123.1	1171.9	94.2	Antelope Wells
297	418.1	5844.5	36096.2	4.9	7.4	10.4	18.4	0.0	not obsidian
301	1614.5	844.1	23545.3	245.1	2.1	133.2	1261.0	104.8	Antelope Wells
80	1985.2	757.9	19092.8	292.4	0.0	107.6	981.9	84.4	unknown a
245	2019.3	1065.5	24822.3	345.8	5.7	126.0	1206.2	94.2	Antelope Wells
182-1	2127.1	846.7	22296.5	329.3	3.8	105.7	1068.8	76.0	Antelope Wells
182-2	1268.1	369.1	10149.7	241.1	18.1	37.4	112.9	14.9	Mule Creek
244	1432.1	907.0	22020.2	346.6	3.4	129.8	1231.9	98.0	Antelope Wells
249	1825.6	812.7	20067.9	301.1	2.5	108.9	1076.6	83.9	Antelope Wells

* Those specimens noted as "not obsidian" appear to be a fine-grained dark brown or black chert. The unknown assignments (i.e "a" or "b") are specific to this data set and not the greater Southwest overall (see Shackley 1995).

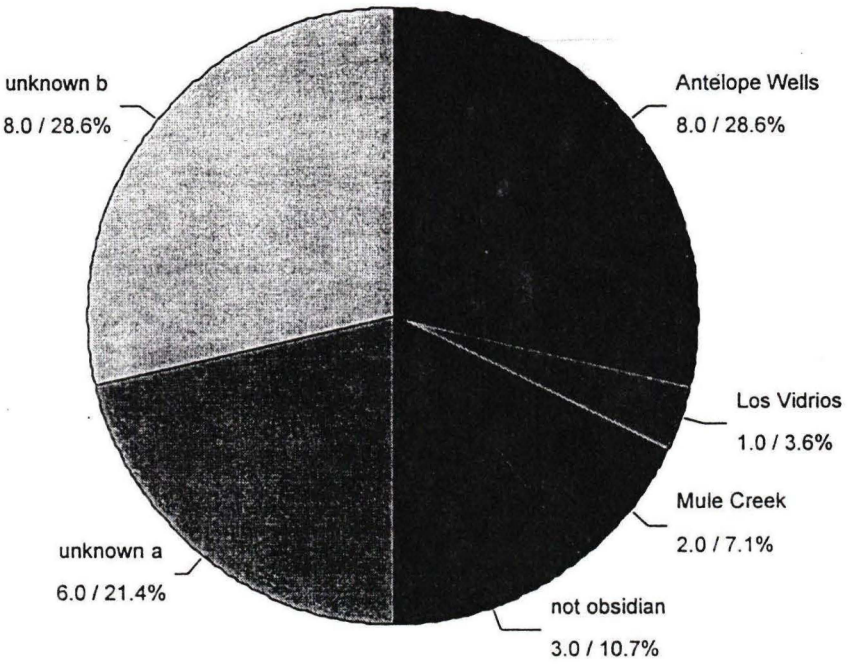


Figure 1. Distribution of obsidian source provenance in AZ FF:12:48(ASM).

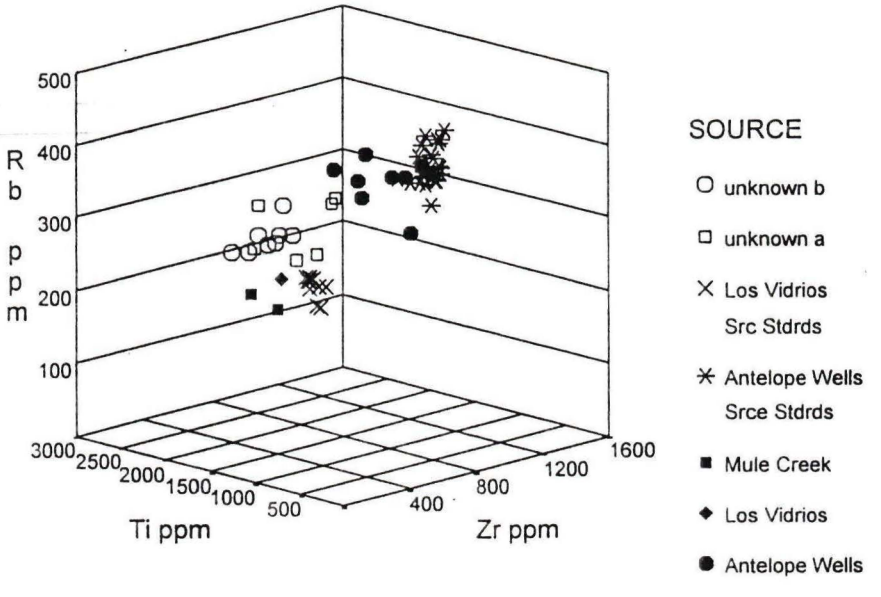


Figure 2. Rb, Ti, Zr three-dimensional plot of archaeological specimens.

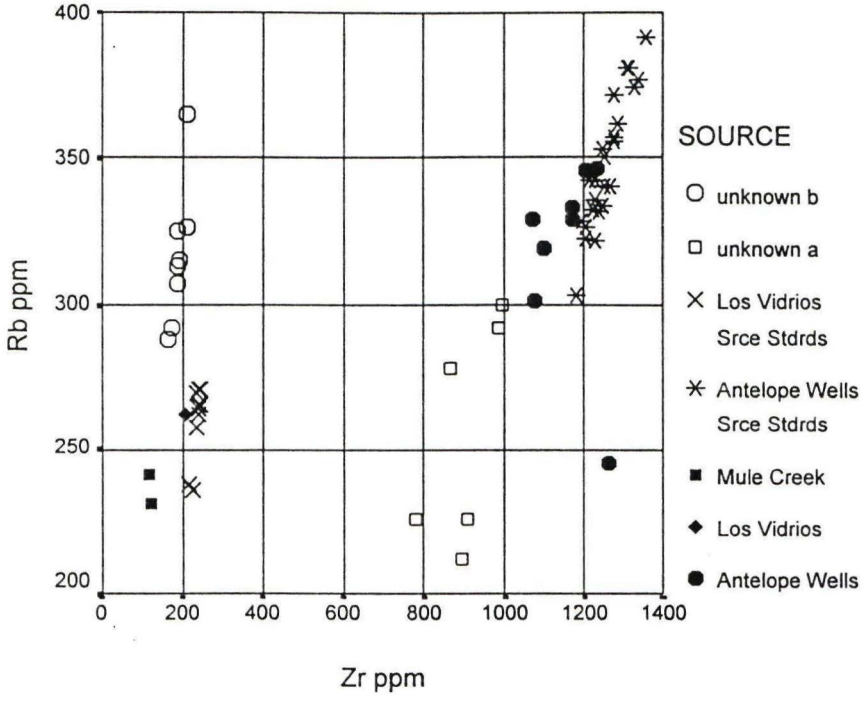


Figure 3. Bivariate Rb versus Zr plot of archaeological specimens. Separation of assigned Antelope Wells artifacts and "unknown a" artifacts is based on 5% variability of Antelope Wells source data. The low Rb Antelope Wells specimen is a provisional assignment, and could be another unknown peralkaline obsidian in the region. The "unknown a" group appears to be bimodal in Rb, or may be the result of two different magma sources. Absence of source standards frustrates assignments at this time.

APPENDIX 7

Ground Stone From the Rising Site:
Manos, Pestle, Metates, and Indeterminate Ground Stone

Appendix 7. Ground Stone From the Rising Site: Manos and Pestle. All measurements are in cm.

Provenience	FS#	Level	Feature	Material	% Present	Plan Shape	Cross Section	Length	Width	Area	Thickness
N1672 E370	159	2		basalt	40	rectangular	wedge	5.5+	8.1+		3.4
N1674 E372	90	surface		granite	50	circular	tabular	9.5+	6.5+		4.9
N1674 E372	92	surface		dacite	100	circular	wedge	11.3	9.6	108.5	4.2, 2.5
N1674 E372	94	surface		rhyolite	70	circular	turtleback	11.9	9.2+		6.3
N1965 E433	68	surface	2	granite?	70	rectangular	turtleback	13	7.8+		6.8
N1965 E433	303	surface	2	basalt	50	circular	tabular	7.4+	7.5+		3.3
N1991 E488	145	1		granite	45	circular	tabular	5.0 +	8.3+		3.6
N1991 E488	148	1		sandstone	25	?	turtleback	9.9+	6+		6.1
N1991 E488	149	1		rhyolite	90	circular	turtleback	8.7+	8.6		6.6
N1991 E488	345	1		granite	5	circular?	?	5.3+	2+		3.2+
N1997 E484	9	surface		granite	30	circular	tabular	5.2+	6.5+		4.3
N1997 E484	11	surface		granite	90	rectangular	tabular	10.6+	6.8		3.5
N2049.25 E524	130	surface		granite	80	circular?	turtleback	8.7+	8+		5.1
N2049.25 E524	193	1		rhyolite	5	?	?	6.1	3+		4.5+
N2049.25 E530	126	surface		tuff	85	rectangular	wedge	11.5+	8		4
N2049.25 E532	83	surface		granite	25	circular	tback/wedge	5.4+	4.8+		4.7
N2049.25 E532	168	1		granite	5	?	wedge	3.4+	3.4+		3.8+, 1.6
N2049.25 E534	60	surface		rhyolite	100	oval	tabular	15.4	10.5	161.7	5.5
N2049.85 E534.25	183	1		granite	100	circular	wedge	16.8	16.2	272.2	6.7
N2050 E530 NE Quad	268	surface		granite	70	circular	wedge	9.4+	13.8+		6.8, 5.0
N2050 E530 NE Quad	285	surface		basalt	50	oval	tabular	9.7+	9.5+		3.6
N2050 E530 NW Quad	210	surface		rhyolite	75	circular	tabular	7.5+	6.8+		4.7
N2050 E530 SE Quad	286	surface		basalt/tuff	75	circular	wedge	8.3+	8.1+		4.6, 1.6
N2050 E530 SE Quad	288	surface		granite	75	circular	wedge	7.5+	8.3		4.6, 1.7
N2050 E530 SE Quad	289	surface		granite	25	oval	?	8.3+	4.5+		4.5+
N2050 E530 SE Quad	291	surface		granite	20	?	wedge/tback	5.8+	6.2+		5.3+
N2050 E530 SE Quad	294	surface		rhyolite	60	rectangular	tabular	11.9	7.3+		6.6
N2050 E530 SW Quad	216	surface		granite	70	rectangular	tabular	9.4+	7		7.4
N2050 E530 SW Quad	282	surface		granite	100	circular	wedge	10.8	9.8	105.8	6.2, 1.5
N2050 E530 SW Quad	283	surface		granite	100	?	?	6.3	3.3	20.79	4.3

Provenience	FS#	Level	Feature	Number of Grinding Surfaces	Secondary Use	Comments
N1672 E370	159	2		1		
N1674 E372	90	surface		1		
N1674 E372	92	surface		1		
N1674 E372	94	surface		1		
N1965 E433	68	surface	2	1		heavy, shiny grinding surface
N1965 E433	303	surface	2	2		
N1991 E488	145	1		2		one edge shaped
N1991 E488	148	1		1?		very eroded; ground stone?
N1991 E488	149	1		1		convex grinding surface
N1991 E488	345	1		1		from FS# 151; burned
N1997 E484	9	surface		1		
N1997 E484	11	surface		1		
N2049.25 E524	130	surface		1?		convex grinding surface
N2049.25 E524	193	1		1		only edge present
N2049.25 E530	126	surface		1	mortar?	miniature basin metate!
N2049.25 E532	83	surface		1		edge battering
N2049.25 E532	168	1		2		
N2049.25 E534	60	surface		1		
N2049.85 E534.25	183	1		1		possible metate; pollen wash
N2050 E530 NE Quad	268	surface		2		edges shaped
N2050 E530 NE Quad	285	surface		1		edges may be shaped
N2050 E530 NW Quad	210	surface		3		ground edge
N2050 E530 SE Quad	286	surface		2		pecking at thinner edge
N2050 E530 SE Quad	288	surface		2		shaped by pecking
N2050 E530 SE Quad	289	surface		1		heavy grinding
N2050 E530 SE Quad	291	surface		1		
N2050 E530 SE Quad	294	surface		1		
N2050 E530 SW Quad	216	surface		0		pestle; pecking present
N2050 E530 SW Quad	282	surface		1?	pecking?	possibly ground stone
N2050 E530 SW Quad	283	surface		1		possibly ground stone

Appendix 7. Ground Stone From the Rising Site: Metates. All measurements are in cm.

Provenience	FS#	Level	Feature	Material	% Present	Plan Shape	Cross Section	Length	Width	Thickness
N1672 E370	257	3		basalt	20	slab/basin	wedge	13.4+	8.6+	5.8
N1672 E 370	256	3		granite	30	slab	tabular	21.6+	10.8+	8.5
N1672 E370	160	2		granite	40	basin	basin	23.5+	31.6+	12.9, 7.7
N1672 E370	161	2		granite	65	slab	tabular	32.1	29.1+	7.5
N1672 E370	258	3		basalt	50	circular	wedge	21.5	13.5+	10.5
N1672 E370	267	3		dacite?	100	basin	wedge	55.3	47.6	22.7, 8.3
N1674 E372	95	surface		basalt	40	basin	wedge	49.1	18.8+	9.4, 4.7
N1965 E433	70	surface	2	rhyolite	10	slab?	?	11.6+	8.3+	6.5+
N1991 E488	140	1		granite	10	slab?	tabular?	8.4+	4.6+	5.9+
N1991 E488	141	1		granite	10	slab	tabular	5.8+	6.8+	10.5
N1991 E488	143	1		granite	5	slab	tabular	6.2+	4.9+	10.6
N1991 E488	146	1		granite	10	slab?	tabular	6.1+	6.1+	11.1
N1991 E488	147	1		granite	10	?	?	7.4+	6.3+	5+
N1991 E488	152	1		v. basalt	15	slab?	wedge	19.0+	13.8+	8.6
N1991 E488	153	1		granite	95	slab	tabular	18.5	14.7	4.5
N1997 E480	16	surface		granite	10	basin?	wedge	8+	6.8	6+, 4+
N2050 E530 NE Quad	269	surface		basalt	40	slab	wedge	36.9+	20.8+	5.8, 3.3
N2050 E530 NE Quad	270	surface		granite	10	slab/basin	wedge	10.6+	9.6+	8.3
N2050 E530 NE Quad	284	surface		rhyolite	30	basin	tabular	16.8+	9.6+	5, 3.7
N2050 E530 SE Quad	220	surface		granite	30	slab	tabular	20.1+	12.6+	3.8+
N2050 E530 SE Quad	290	surface		rhyolite	15	slab	tabular	7.8+	7.4+	1.8
N2050 E530 SE Quad	292	surface		granite	5	slab?	tabular	15.5+	2.5+	7.6

Provenience	FS#	Level	Feature	Number of Grinding Surfaces	Grinding Surface Length	Grinding Surface Width	Comments
N1672 E370	257	3		2	11.7+, 8.8+	7+, 6.4+	basin measures 1st; burned
N1672 E 370	256	3		2	15.2+, 8.8+	18.6+, 9.9	3 pieces=1 MNI
N1672 E370	160	2		1	17.1+	25.6+	
N1672 E370	161	2		1	27	20.5+	
N1672 E370	258	3		2?	14.7+, 14+	12.1+, 11.2+	possible ground stone
N1672 E370	267	3		2	37.4, 49.4	24.4, 35.3	both sides ground
N1674 E372	95	surface		1	25.8	10.8+	
N1965 E433	70	surface	2	1	11.6+	7.2+	
N1991 E488	140	1		1	8.4+	4.6+	
N1991 E488	141	1		1	4.5+	5.3+	fits w/ #143 & probably w/ #146
N1991 E488	143	1		1	6.2+	4.9+	fits with #141; should w/ #146
N1991 E488	146	1		1	5.8+	5.2+	should fit w/#143 and #141
N1991 E488	147	1		1?	7.4+	3.6+	possibly not ground stone
N1991 E488	152	1		1	12.8+	12.9+	
N1991 E488	153	1		2	18.5	10.5+	small slab
N1997 E480	16	surface		1	7.0+	5.9+	
N2050 E530 NE Quad	269	surface		1	27.4+	14.8+	platy material w/ igneous hints
N2050 E530 NE Quad	270	surface		2	9.4+, 7.8+	8.2+, 5.9+	basin measurements 1st
N2050 E530 NE Quad	284	surface		1	14.6+	7.9+	
N2050 E530 SE Quad	220	surface		1	20.1+	12.6+	
N2050 E530 SE Quad	290	surface		1	5.7+	7.4+	possibly not ground stone
N2050 E530 SE Quad	292	surface		1	10.7	2.5+	

Appendix 7. Ground Stone From the Rising Site: Indeterminate Ground Stone. All measurements are in cm.

Provenience	FS#	Level	Material	% Present	Plan Shape	Cross Section	Length	Width	Thickness	Number of Grinding Surfaces	Comments
N1672 E370	156	2	tuff	5	?	wedge?	4.1+	3.5+	2.7+	1	
N1674 E372	155	surface	rhyolite	5	?	?	6.9+	5.2+	5.1+	1	
N1991 E488	144	1	granite	5	?	?	5.1+	2.3+	3.6+	1	burned
N1997 E480	17	1	basalt	5	circular?	?	3.9+	2.3+	3.7+	1	
N1997 E484	10	surface	basalt	10	?	?	7.5+	3.5+	3.4+	1	possible metate
N1997 E484	12	surface	granite	10	?	?	5.2+	4.2+	7.3+	1	
N1997 E484	13	surface	rhyolite	10	?	tabular	10+	5.2+	5.2	1	mano or metate
N2049.25 E534	304	surface	granite	1	?	?	3.4+	1.3+	3.6+	1?	shaped edge of mano?
N2049.25 E536	64	surface	rhyolite	5	?	?	4.5+	4.3+	2.8+	1	burned
N2050 E530 SE Quad	287	surface	granite	5	?	tabular	4.7+	6.8+	4	2	more metate-like
N2050 E530 SE Quad	293	surface	tuff	1	?	?	3+	1.7+	4.2+	1?	shaped edge of mano?
N2050 E530 SE Quad	295	surface	basalt	5	?	?	7.2+	5.7+	1.9+	1	

APPENDIX 8

Sorted and Scanned Ethnobotanical Samples From the Rising Site

by Paul E. Minnis

Ethnobotanical Samples from the Rising Site Project--1997

Provenience	FS#
SORTED	
1672N 370E; 31 cm	265
1674N 372E; surface	253
1942 N 418E; 0-20cm	46
1965N 433E; level @l; Feature 2	101
199IN 488E; level 1; 30-40cm	180
1997N 480E; level 1, 25-35cm	20
1997N 480E; level 29 (35-45cm)	206
1997.05N 48 1. IE; level 2 (3 5-45cm); Feature 3	100
1997.5N 480.45E; level 2 (36-44cm)	207
2018N 488E; level 1 (30-50cm)	52
2028N 459E; 13cm; Feature 1	27
2028N 459E; 18cm; Feature 1	28
2028N 459E; 23cm; Feature 1	29
2037N 503E; level 1; Feature 5	110
2037N 503E; level 2; Feature 5	112
2049.25N 530E; level 1; below possible floor	279
2049.25N 530E; level 2	178
2049.25N 537E; level 3	179
2077N 559E; level 1; Feature 6	186
2077N 559E; level 2; Feature 6	190
SCANNED	
1997N 480E; level 2	135
2018N 488E; 30-50cm	181
2049.25N 524E; level 1	133
2049.25N 530E- level 1	118
2049.25N 532E; 60-1??	122
2049.25N 532E (El/2); level 2	194
2049.25N 534E; level 1	87
2049.25N 536E; level 1	86
2049.25N 538E; level 1	41

MACROPLANT ANALYSIS

Chiracahua - Gilmar
Project

1672 N
A2:FF:12:48 370 E 31cm
Site Provenience

Notes: 3.5 Liters FS 265

OPERATION

___	Scan	___	___
X	Sort	Minnis	10-29-97
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
7.20	-	-	7 99%

WOOD no pieces large enough for identification

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Cheno-Am	21		uncharred
Mollugo	57		uncharred
~~Chenopodium~~	~~1~~		~~uncharred~~

NOTES:
- Uncharred seeds not collected
- 7.50 sorted
- .25-.50 scanned

MACROPLANT ANALYSIS

Chivacahua - Gilman
Project

A2 FF: 12:40 (3)
Site

1674 N
372 E
surface
Provenience

FS 253

Notes: 3 liters

OPERATION

____	Scan	____	____
X	Sort	p.minnis	10-29-97
____	%Sort	____	____
____	Wood	____	____
____	Other	____	____

Weight	Sorted Weight	% Sorted	%Contamination

WOOD pieces too small to id

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Euphorbia	1, (1)		uncharred
Portulaca	5, 12 (17)		uncharred
unknown 1	1, (1)		uncharred
Cheno-Am	37, 17 (54)		uncharred

NOTES:

MACROPLANT ANALYSIS

Project

FF: 12:48 | 1942 N 418 E | 0-20 cm | H 46

Site | Provenience

Notes: 2.0 liters

OPERATION

___	Scan		
X	Sort	P. Minnis	May 13 '98
___	%Sort		
___	Wood		
___	Other		

Weight	Sorted Weight	% Sorted	%Contamination
1.55			90 %

WOOD pieces too small to id.

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Proposis meco-carp	1		uncharred
chenop-Am	24		"
?	1		"

NOTES: uncollected uncharred chenop-Ams 3 + 24 ? 1

MACROPLANT ANALYSIS

Chiripa - Gloor
Project

1965 N
433 E
A2:FF:12:48 Level 1
Site Provenience

#101

Notes: 2,4 liters

OPERATION

___	Scan	___	___
X	Sort	P. minnis	15 may '98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

205 gm — Weight
___ — Sorted Weight
90% — % Sorted
___ — %Contamination

WOOD pieces too small to id

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Cheno-Am	78		uncharred
mullugo	4		"
Portulaca	18		"
Graminae	2		"

NOTES:

uncharred uncollected
cheno-Am 3+11 r64
mullugo 4
18
2

lots of rootlets

MACROPLANT ANALYSIS

Chiracahua - Gilman
Project

991 N
488 E
Level 30-40
AZ:FF:12:18
Site Provenience #180

Notes: 1.9 liters

OPERATION

___	Scan	___	___
X	Sort	pm	May 12 '98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
1.95			+90%

WOOD pieces too small to id

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Chenopodium	1		charred (bulged)
Chano-Am	100s		uncharred
Portulaca	5		"
Verbena	2		"
Mollugo	34		"
Capparidaceae	1		"

NOTES: uncollected uncharred

~~Grass Fam~~ 23
Chano-Ams 21 +100s
Portulaca 4
Verbena 2

some insect chitin

MACROPLANT ANALYSIS

Chiracahua- Gilmer
Project

1997 N
480 E
A2 FF:12:48 25-35cm
Site Provenience FS #20

Notes: 5.4 liters

OPERATION

____	Scan	____	____
x	Sort	p. ponderosa	SI Cat 97
____	%Sort	____	____
____	Wood	____	____
____	Other	____	____

Weight	Sorted Weight	% Sorted	%Contamination
2.70			90%

WOOD pieces too small to id.

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Sporobolus ~~Gramineae~~	1		charred
Amaranthus	1		charred
Capparidaceae	3		uncharred
Aizoaceae	1		uncharred
Portulaca	103		uncharred
Mullugo	18		uncharred
Cheno-Am	46		uncharred

NOTES:

MACROPLANT ANALYSIS

Chiracahua - Gilmar
Project

1997 N
480 E
A2 FF: 12:48 35-45
Site Provenience FS 206

4 liters
Notes:

OPERATION

___	Scan	___	___
v	Sort	p. minais	31-Oct-97
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
1.65	-	-	95%

WOOD pieces too small to id

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Cheno-Am	5		uncharred
Portulaca	7		
Gramineae	1		
Mollugo	2		

NOTES:

MACROPLANT ANALYSIS

Project

1997.05 N
481.10 E
FF:12:48 L2
Site Provenience #100

Notes: 4.6 liter

OPERATION

___	Scan	___	___
x	Sort	P. MINAK	15 May '98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
1.10			aq %

WOOD pieces too small to id

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Cheno-Am	49		uncharred
gramineae	4		
Portulaca	12		

NOTES:

uncollected
uncharred

chenopodium 1+48
[illegible] 4
Portulaca 12

MACROPLANT ANALYSIS

Chiracahua - Gilman
Project

1997.5 N
480.45 E
36-44 cm
A2 FF:12:48
Site Provenience

FS #207
3.5 Liters
Notes:

OPERATION

___	Scan	___	___
x	Sort	p.m	31 Oct '97
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
2.50	—	-	99

WOOD

pieces too small to id.

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Chenopodium	5		charred
fragments	4		charred
Gramineae	1		charred
Chenopodium	7		uncharred

NOTES:

MACROPLANT ANALYSIS

Project

Site: AR:FT 12:48 Provenience: 2018 N 488 E L1 #52

Notes: 2.0 liters

OPERATION

___	Scan	___	___
X	Sort	f. minns	15 May '98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
.35			99%

WOOD pieces too small to id.

Taxon	Number	Weight	Condition/Notes

PROPAGULES

frag	1		charred
Chero-Am	4		uncharred
Mullugo	3		"
Gramineae	6		"
Portulaca	2		"

NOTES:

uncalcined
unburned

Chero-Am 2 x 2
Gramineae 1 + 5
Mull. 3

MACROPLANT ANALYSIS

Project

Site: FF:12:48 Provenience: 2028 N 454 E 13 cm

Notes: 2.0 l. #27

OPERATION

___	Scan	___	___
X	Sort	R. Minnis	15 May '98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
7.7 gm			95%

WOOD (9)

Taxon	Number	Weight	Condition/Notes
Platanus	IIII III (8)	.55 gm	charred
Prosopis/Leg.	1 (1)	.05	"

PROPAGULES

Opuntia Cholla	1		uncharred
Cheno-Am	100s		uncharred
(00)	5		"
Portulaca	44		"
Gramineae	20		"
Anoaceae	1		"

NOTES:

uncharred

Portulaca 4 + 40
Cheno-Am 12 + 47 + 100s
5
20

MACROPLANT ANALYSIS

Project

2028 N
459 E
FF:12:48 18 cm
Site Provenience

Notes: 2.2 liters #28

OPERATION

___	Scan	___	___
X	Sort	flotation	15 May 96
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
8.65 gm			80

WOOD (20)

Taxon	Number	Weight	Condition/Notes
Platanus	⧻ |||| (9)		charred
Prosopis / Legum	⧻ ⧻ (10)		"
Atriplex	1 (1)		"

PROPAGULES

Chreno-Am	140		uncharred
Portulaca	36		"
(w)	2		"

NOTES:

uncalibrated
uncharred

Portulaca 11 + 25
chreno/Am 4 + 134

MACROPLANT ANALYSIS

Project: [illegible] 2028 N 459 E Lev. 3

Site: AZ:FF:12:48 Provenience: 2.0 liters #29

Notes:

OPERATION

___	Scan	___	___
X	Sort	pm	May 12 '98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
2.55			99 %

WOOD (6)

Taxon	Number	Weight	Condition/Notes
Prosopis / Legum	IIII (4)	.05 gm	charred
Platanus	II (2)	.10 gm	"

PROPAGULES

Cheno-Am	35		uncharred
Portulaca	8		
(09)	4		

NOTES: uncollected uncharred

Portulaca 7
Cheno-Am 31

MACROPLANT ANALYSIS

Project

2037 N
503 E
Site Provenience level 1

Notes: 2.0 liters # 110

OPERATION

___	Scan	___	___
x	Sort	p. minnis	may 13 '98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
3.7 gm			99%

WOOD pieces too small to id

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Cheno-Am	100s		uncharred
Gramineae	3		"
Mollugo	4		"
Prosopis macrocarp	1		"

NOTES:

uncalibrated

+3 +100s

mollugo 4

Gramineae 3

MACROPLANT ANALYSIS

Project

FF:12:48 2037 N 503 E L 2

Site Provenience #112

Notes: 1.6 liters

OPERATION

___	Scan	___	___
X	Sort	P. minnis	May 8 '98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
190			99%

WOOD pieces too small to id

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Cheno-Am	32		charred
Portulaca	4		"

NOTES:

uncalibrated
Chero-Ams 32
portulaca 4

lots of insect parts

MACROPLANT ANALYSIS

Project: Gilman

2049,25 N
530 E
lev. 1

12:FF:12:48

Site | Provenience

Notes: 4 liters #279

OPERATION

___	Scan	___	___
X	Sort	p. minnic	15 May 1991
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
5.0 gm			99%

WOOD pieces too small to id

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Cheno-Am	29		uncharred
(00)	12		"
Euphorbia	1		"
Portulaca	11		"

NOTES:

uncharred uncollected

Cheno Am 4+52

(00) = 2+1

Euphorbia 1

MACROPLANT ANALYSIS

Project: Cahuachu Cimarron

Site: AZ:F:12:48 — Provenience: 2049.25 N, 537 E, L2

Notes: 4.5 liters #178

OPERATION

___	Scan	___	___
X	Sort	p minnis	15 may '98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight: ___ Sorted Weight: ___ % Sorted: ___ %Contamination: 99%

WOOD pieces too small to id

Taxon	Number	Weight	Condition/Notes

PROPAGULES

Cheno-Am	100s		uncharred
Mollugo	12		"
Graminae	7		"

NOTES: uncalibrated uncharred
cheno Am: 100s
mollugo 12
gramineae 7

MACROPLANT ANALYSIS

Chiacahua Gimar
Project

2049.2: N
A2:FF:12:48 537 E 13
Site Provenience

#179
Notes: 4.0 litres

OPERATION

___	Scan	___	___
X	Sort	9 mins	May 12 98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
1.80 gm			99%

WOOD pieces too small to id

Taxon	Number	Weight	Condition/Notes

PROPAGULES

fragment	1		charred
Cheno-Am	22		uncharred
Mullugo	1		"
Portulaca	3		"
(4)	1		"

NOTES: uncalibrated
Cheno-Am 19
Mullugo 1
Portulaca 3

MACROPLANT ANALYSIS

Chivacahua Gilmore
Project

AZ:FF:12:48 2077 N 559 E kiva 1
Site Provenience #126

Notes: 2.0 liters

OPERATION

___	Scan	___	___
X	Sort	p. mineis	15 May '98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
14.85			90%

WOOD (13)

Taxon	Number	Weight	Condition/Notes
Atriplex	IIII (4)	.40	charred
Prosopis / Legum.	IIII III (8)	.90	charred
Quercus	I (1)	.05	charred

PROPAGULES

Opuntia (prickly pear)	3		
Cheno-Am	100s		uncharred
Mollugo	1		uncharred
Gramineae	5		uncharred
(1)	4		uncharred

NOTES:

uncharred cheno-am 12 +100s
cheno-am
mollugo 1
with 4 lots of chaff

MACROPLANT ANALYSIS

Project

2077 N
559 E
Site AZ:FF:12:48 Provenience lev. 2

Notes: 2.0 liters #190

OPERATION

___	Scan	___	___
X	Sort	CM	May 13 '98
___	%Sort	___	___
___	Wood	___	___
___	Other	___	___

Weight	Sorted Weight	% Sorted	%Contamination
25.05			50%

WOOD (20)

Taxon	Number	Weight	Condition/Notes
Prosopis / Legum.	IIII IIII II (12)	3,95	charred
Atriplex	IIII I (6)	1,40	charred
unknown	II (2)	,40	charred

PROPAGULES

unknown	1		charred
Cheno-Am	49		uncharred
(00)	38		"
Gramineae	8		"
Alzoaceae	2		"

NOTES:

uncollected Cheno-Am 36 + 41
unknown (1) - 24 + 10
Gramineae - 1

APPENDIX 9

Faunal Descriptions From the Rising Site

by Kari M. Schmidt

Appendix 9. Faunal Descriptions From the Rising Site.

Provenience	FS#	Level	Feature	Description	NISP
N1997 E484	2	surface		unid cancellous frag (CA)	1
N1997 E484	2	surface		unid shaft frags (CA)	2
N2049.25 E536	37	1		unid cancellous frag (CA)	1
N1997 E480	42	1		Medium/lg mammal shaft frag (CA, mineralized)	1
N1997 E480	42	1		Sylvilagus proximal tibia (L, CH)	1
N1997 E480	42	1		unid shaft frags (3CA, 2CH, 7UB)	12
N2049.25 E536	55	1		unid frag	1
N2049.25 E534	87	1		unid frags (2BU, 20UB)	22
N2049.25 E534	105	1		unid frags (CH)	2
N2049.25 E534	105	1		Lepus sp. distal humerus (L, CH)	1
N2049.25 E534	105	1		Lepus sp. lumbar vert frag	1
N2049.88 E537.78	119	1		Artiodactyl long bone shaft (cf. femur frag, CH)	1
N2049.88 E537.78	119	1		unid shaft frags (2CH, 3UB)	5
N2049.88 E537.78	119	1		unid frags (UB)	7
N1997 E480	139	2		unid shaft frags (1CH, 1UB)	2
N1997 E480	139	2		unid frags	2
N1997 E480	139	2		Testudinata plastron frag??	1
N1997 E480	139	2		Sylvilagus sp. distal femur (R)	1
N1997 E480	139	2		Sylvilagus sp. calcaneus (R)	1
N1991 E488	142	1		Odocoileus sp. metatarsal frag (BU)	1
N1991 E488	142	1		Medium/lg mammal shaft frags (CA)	2
N1991 E488	142	1		Medium/lg mammal cancellous frags (2CA, 1UB)	3
N1991 E488	142	1		unid frags (1UB, 2CH, 6CA)	9
N1991 E488	142	1		unid shaft frags (9CA, 1CH)	10
N1991 E488	142	1		Shaft frags cf. Lepus sp. (CA)	2
N1991 E488	142	1		Lepus sp. distal humerus frag (CH)	1
N1991 E488	142	1		Lepus sp. proximal calcaneus (CH)	1
N1991 E488	142	1		Sylvilagus sp. tibia epiphysis (L, BU)	1
N1997 E480	199	2		Sylvilagus sp. metatarsals (CH)	4

Provenience	FS#	Level	Feature	Description	NISP
N1997 E480	199	2		Sylvilagus sp. tarsal (prob articiular w/ metatarsals)	1
N1991 E480	243	1		unid shaft frag (BU)	1
N1672 E370	262	3		unid frag	1
N2049.25 E538	309	1		unid frags (UB)	2
N1965 E433	311	1	2	unid frags (UB)	2
N2049.25 E530	313	1		unid frag (CA)	1
N1997 E480	317	1		unid frags (6BU, 5CA, 5CH, 6UB)	22
N1997 E480	317	1		unid shaft frags (2BU, 2CA, 3UB)	7
N1997 E480	317	1		Sylvilagus sp. terminal phalange	1
N1997 E480	319	2		unid shaft frags (CH)	2
N1997 E480	319	2		unid frags (3CH, 1BU)	4
N1997.05 E481.1	321	2	3	unid frags (3UB, 3BU)	6
N1997 E480	325	2		unid frags (UB)	4
N1672 E370	328	3		unid frags (CH)	3
N1997.5 E480.45	330	2		unid frags (1BU, 2UB)	3
N1997.5 E480.45	330	2		unid shaft frags (1CH, 1UB)	2
N1674 E372	332	surface		unid frag (CH)	1
N1991 E488	336	1		Lepus sp. distal phalanges (1BU, 1UB)	2
N1991 E488	336	1		Sylvilagus inominate frag (acet. & ilium, BU, L)	1
N1991 E488	336	1		Indet. Rodent long bone (UB)	1
N1991 E488	336	1		unid frags (CH)	2
N1991 E488	336	1		unid shaft frags (1CA, 3BU, 3CH, 4UB)	11
N2049.25 E536	339	1		unid frags (2BU, 1CH, 3UB)	6
N2049.25 E532	341	1		unid frags (UB)	2
N1942 E418	342	1		unid frags (BU)	3
N2049.25 E530	347	1		unid frags (UB)	2
Total					192

Key: CA=calcined; CH=charred; BU=burned; UB=unburned
L=left; R=right; unid=unidentified; cf.=compares favorably with